GE Medical Systems

Technical Publications

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Revision 1

LOGIQ™ 400

CE 0459

Basic Users Manual

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Operating Documentation

Regulatory Requirement

This product complies with regulatory requirements of the following European Directive 93/42/EEC concerning medical devices

CE 0459

This manual is a reference for the LOGIQ™ 400 PRO. It applies to all versions of 5.01 software for the LOGIQ™ 400 ultrasound systems.

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Regulatory Requirements

This product complies with the regulatory requirements of the following:

- Council Directive 93/42/EEC concerning medical devices:

  the CE 0459 label affixed to the product testifies compliance to the Directive.

  The location of the CE marking is shown on 2–24 of this manual.

  European registered place of business:

  GE Medical Systems Europe
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  BP 34
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  Tel: +33 (0)1 30 70 40 40

- Medical Device Good Manufacturing Practice Manual issued by the FDA (Food and Drug Administration, Department of Health, USA).
- Underwriters' Laboratories, Inc. (UL), an independent testing laboratory.
- Canadian Standards Association (CSA).
- International Electrotechnical Commission (IEC), international standards organizations, when applicable.

For USA Only

Caution: United States law restricts this device to sale or use by or on the order of a physician.

- *General Electric Medical Systems* is ISO 9001 and EN 46001 certified.
- The original document was written in English.

NOTE: This equipment generates, uses and can radiate radio frequency energy. The equipment may cause radio frequency interference to other medical and non-medical devices and radio communications. To provide reasonable protection against such interference, this product complies with emissions limits for a Group 1, Class A Medical Devices Directive as stated in EN 60601–1–2. However, there is no guarantee that interference will not occur in a particular installation.

NOTE: If this equipment is found to cause interference (which may be determined by turning the equipment on and off), the user (or qualified service personnel) should attempt to correct the problem by one or more of the following measure(s):

- reorient or relocate the affected device(s)
- increase the separation between the equipment and the affected device
- power the equipment from a source different from that of the affected device
- consult the point of purchase or service representative for further suggestions

NOTE: The manufacturer is not responsible for any interference caused by using other than recommended interconnect cables or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the users' authority to operate the equipment.

NOTE: To comply with the regulations on electromagnetic interference for a Class A FCC Device, all interconnect cables to peripheral devices must be shielded and properly grounded. Use of cables not properly shielded and grounded may result in the equipment causing radio frequency interference in violation of the FCC regulations.

NOTE: Do not use devices which intentionally transmit RF Signals (cellular phones, transceivers, or radio controlled products) in the vicinity of the equipment as it may cause performance outside the published specifications. Keep the power to these type devices turned off when near this equipment.

The medical staff in charge of this equipment is required to instruct technicians, patients, and other people who may be around this equipment to fully comply with the above requirement.

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System Overview

Attention

This manual contains enough information to operate the system safely. Advanced equipment training may be provided by a factory trained Applications Specialist for the agreed upon time period.

Read and understand all instructions in this manual before attempting to use the LOGIQ™ 400 system.

Keep this manual with the equipment at all times. Periodically review the procedures for operation and safety precautions.

Documentation

LOGIQ™ 400 Documentation consists of three manuals:

- The Quick Start Guide (TRANSLATED) provides a step-by-step description of the basic features and operation of the LOGIQ™ 400. It is intended to be used in conjunction with the Basic User Manual in order to provide the information necessary to operate the system safely.

- The Basic User Manual (TRANSLATED) provides information needed by the user to operate the system safely. It describes basic functions of the system, safety features, operating modes, basic measurements/ calculations, probes, user care and maintenance.

- The Advanced Reference Manual (ENGLISH ONLY) is intended for the trained, professional user. It contains the information on options, advanced customization techniques and data tables.

The LOGIQ™ 400 manuals are written for users who are familiar with basic ultrasound principals and techniques. They do not include sonography training or clinical procedures.

Physical Principle Used

The transmission and reception of mechanical high frequency waves through a transducer associated with a computer that creates the image in a digital memory, are used for the creation of medical ultrasound images. The spreading of mechanical ultrasound waves produces echoes when body changes density. In the case of human tissue, these echoes are created when the signal goes from an adipose tissue (fat) region to a muscular tissue region, among others. The echoes are returned through the same transducer that converts them back into electrical signals. These signals are highly amplified, processed by filters with several frequency and time response options, and finally scanned and stored in a digital memory. Once in the memory, the image can be displayed in real-time on a monitor. Several analog and digital circuits transform the electrical high frequency signals into a flow of digital signals, allowing the composition of the image in the memory. All the signal reception and transmission parameters are controlled by the main computer. Through the selection of these parameters by the operator, the system modifies the transmission and reception features allowing a wide range of uses, from obstetrics to peripheral vascular examinations. As its design is based on solid state components, the system is free from variations over time and requires very little maintenance. All the transducers are accurate solid state devices, allowing control of creation of images from convex, micro-convex and linear transducers. The use of a solid state design allows a wide range of sweep parameters that can be optimized resulting in a consistent creation of fine anatomical details with excellent penetration and dynamic contrast band in the tissue. The system features a sophisticated design, providing multiple functions of diagnostic and function setup keys. This makes the system user-friendly and easy to use.

General Indications for Use

The LOGIQ™ 400 is a general purpose ultrasound imaging system intended for use in the dynamic evaluation of soft tissue and vascular diseases in the following areas:

- Head
- Neck
- Chest
- Abdomen
- Pelvis
- Male reproductive organs
- Female reproductive organs
- Limbs/Extremities
- Pregnant uterus
- Cardiac

Indications for Fetal Doppler use

The LOGIQ™ 400 system can be used for fetal examination in Pulsed Wave Doppler, Continuous Wave Doppler, Color Flow Doppler, and Color M-Mode for the diagnosis of:

- Structural fetal cardiac anomalies for high-risk patients.
- Intrauterine growth retardation (IUGR) for high-risk patients with one or more of the following known or suspected conditions:
    - Multiple pregnancy
    - Maternal hypertension
    - Hydrops
    - Diabetes
    - Lupus
    - Placenta abnormality

Contraindications

The system is **NOT** intended for use in the following areas:

Ophthalmic use (or any use causing the acoustic beam to pass through the eye).

Pulsed Wave Doppler, Continuous Wave Doppler, Color Flow Doppler, and Color M-Mode are not intended for routine fetal examination or screening nor are they intended for fetal examination in a low-risk population. The use of Doppler, even at minimal output levels, in fetal examination must be adjunctive with conventional fetal echocardiography and other clinical diagnostic methods, for high risk patients only.

Prescription Device

For USA Only

Caution: United States law restricts this device to sale or use by or on the order of a physician.

LOGIQ™ 400/LOGIQ™ 400CL Functionality

Item	LOGIQ™ 400 PRO Series		
	Color System	Black/White System	LOGIQ™ 400CL PRO
Image Memory	B-Mode 4–8 images	B-Mode 4–8 images	B-Mode 4–8 images
Cine Memory	31 Standard *1	31 Standard *1	31 Standard *1
PWD, CFM function	Available	Available (with Doppler and CFM Option)	Available
CWD function	Available	Available (with Doppler Option)	Available
Sector Scan	Available	Available	Not Available
Extended Cine Memory Option	Available	Available	Available
Third Probe Port Option	Available	Available	Available
Foot Switch Option	Available	Available	Available
Swivel Lock Option	Available	Available	Available
Realtime Auto Doppler Trace Option	Available	Available (with Doppler Option)	Available
Power Doppler Imaging Option (PDI Option)	Available	Available (with CFM Option)	Available
B Color Option	Available	Available (with CFM Option)	Available
ATO Map Option	Available	Available	Not Available
THI (Tissue Harmonic Imaging) Option	Available	Available	Not Available
CFM Capture Option	Available	Available (with CFM Option)	Available
ACE Option	Available	Available (with CFM Option)	Available
ACE-2 Option Directional Advanced CFM Map Very Small for Packet Size	Available	Available (with CFM Option)	Not Available

*1: Cine memory capacity is 31 frames with 128 beams.
Available: Available as Option or Standard
Not Available: Not available as Option or Standard

Table 1–1. LOGIQ™ 400/LOGIQ™ 400CL Functionality

LOGIQ™ 400/LOGIQ™ 400CL Functionality (cont'd)

Item	LOGIQ™ 400 PRO Series		
	Color System	Black/White System	LOGIQ™ 400CL PRO
3DvieW Option	Available	Available	Not Available
3D-Surface Option	Available	Available	Not Available
Image Archive Option	Available (with VTRPB)	Available (with VTRPB)	Available (with VTRPB)
OB Calculation Option	Available	Available	Available
Multi–gestation Calculation Option	Available	Available	Available
Fetal Trend Option	Available	Available	Available
Follicles Report Page	Available	Available	Available
Basic Cardiac Calculation Option	Available	Available	Available
Advanced Cardiac Calculation Option	Available	Available	Not Available
ECG Option	Available	Available	Available
Basic Vascular Calculation Option	Available	Available	Available
Advanced Vascular Calculation Option	Available	Available	Available
Heading VCR Playback Option	Available	Available	Available
VTR Playback (VTRPB) Option	Available	Available	Available
VTR Remote control	Available	Available	Not Available

*1: Cine memory capacity is 31 frames with 128 beams.
Available: Available as Option or Standard
Not Available: Not available as Option or Standard

Table 1–1. LOGIQ™ 400/LOGIQ™ 400CL Functionality (cont'd)

Who To Contact

Contacting GE Medical Systems—Ultrasound

For additional information or assistance, please contact your local distributor or the appropriate support resource listed below:

USA

GE Medical Systems
Ultrasound Service Engineering
4855 W. Electric Avenue
Milwaukee, WI 53219

TEL: (1) 800–437–1171
FAX: (1) 414–647–4090

Customer Answer Center

TEL: (1) 800–682–5327
(1) 262–524–5698

CANADA

GE Medical Systems
Ultrasound Service Engineering
4855 W. Electric Avenue
Milwaukee, WI 53219

TEL: (1) 800–664–0732

Customer Answer Center

TEL: (1) 262–524–5698

LATIN & SOUTH AMERICA

GE Medical Systems
Ultrasound Service Engineering
4855 W. Electric Avenue
Milwaukee, WI 53219

TEL: (1) 305–735–2304

Customer Answer Center

TEL: (1) 262–524–5698

EUROPE

GE Ultraschall
Deutschland GmbH & Co. KG
Beethovenstraβe 239
Postfach 11 05 60
D–42655 Solingen

TEL: 0130 81 6370 toll free
TEL: (49)(0) 212.28.02.208
FAX: (49)(0) 212.28.02.28

ASIA

GE Medical Systems Asia
Asia Support Center
67–4 Takakura cho, Hachiouji–shi
Tokyo, 192
JAPAN

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FAX: (81) 426–56–0053

Contacting GE Medical Systems—Ultrasound (cont'd)

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Miranda 5237
Buenos Aires – 1407

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Prinz Eugen Strasse 8/8
A–1040 WIEN

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FAX: +43 1 505 38 74
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FAX: +39 39 73 37 86
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LUXEMBOURG

TEL: 0800 2603 toll free

Contacting GE Medical Systems—Ultrasound (cont'd)

MEXICO
GE Sistemas Médicos de Mexico S.A. de C.V
Rio Lerma #302, 1º y 2º Pisos
Colonia Cuauhtémoc
06500–México, D.F.
TEL: (5) 228–9600
FAX: (5) 211–4631

NETHERLANDS
GE Medical Systems Nederland B.V.
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How This Book is Organized

Manual Content

The LOGIQ™ 400 Basic User Manual is organized to provide the information needed to start scanning right away. Detailed information is also provided for more time-intensive studies.

- **Getting started**. These sections give an overview of the system to help the operator start scanning as soon as possible.
  - *Introduction.* Information concerning indications/ contraindications for use, who to contact and how this documentation is organized.
  - *Safety*. Important information concerning the safe operation of the LOGIQ™ 400 system.
  - *Preparing the System for Use.* How to prepare the system for use and a map of the control layout.
  - *Preparing for an Exam.* How to enter patient information, select an exam category and application preset.
- **Image optimization**. These sections detail how to improve image, trace, or spectral information.
  - *Modes*. How to adjust and optimize B-Mode, Color Flow, Doppler, M-Mode, 3-DvieW and 3D-Surface imaging.
  - *Scanning and Display Functions.* Information concerning Zoom, Freeze, Cine and Annotation functions.

Manual Content (cont'd)

- **Measurements and Reports**. Shows how to do general and exam category specific measurements and calculations.
  - *General Measurements and Calculations*. Emphasis on basic measurements for each mode.
  - *Exam Categories.*
    - *Abdomen and Small Parts.*
    - *OB/GYN.*
    - *Cardiology.*
    - *Vascular.*
    - *Urology.*
- **Recording Images**. Explains the use of image archive and peripheral options.
- **Customizing your system**. Shows how to customize the system for your particular institution, clinic, or exam type.
- **Probes and Biopsy**. Provides intended uses, specifications, care and maintenance, and biopsy capability instructions for each probe.
- **User Maintenance.** Provides information concerning system specifications, error messages, user diagnostics, quality assurance, system care and assistance.

Manual Format

Information has been arranged and provided to help find information easily and quickly.

Finding information

Tables of Contents Locate topics in the main table of contents.

Tabs Chapter tabs are provided.

Headers/Footers The section name and page number appear on the outer corners of every page.

References See also page references that are noted.

Index Meant for frequent and easy reference. Extensive tool that presents ideas, topics, terms, titles, headings, and cross references. Also , use it to find all entries of a like topic throughout the manual.

Text References

LOGIQ™ 400CL

The LOGIQ™ 400CL system does not support every feature of the LOGIQ™ 400. When a feature does not apply to the LOGIQ™ 400CL, the symbol on the left appears.

LOGIQ™ 400 B/W

The LOGIQ™ 400 Black/White system does not come standard with this feature. When a feature is available as an option, the symbol on the left appears.

Text References (cont'd)

Notes Notes are set in *italics*.

Indicates precautions or prudent use recommendations that should be used in the operation of the ultrasound system.

References References to other chapters appear in *italics*.

Icons Various icons highlight safety issues.

DANGER

WARNING

CAUTION

Hints Scanning hints help save time.

Safety Precautions

Precaution Levels

Icon Description

Various levels of safety precautions may be found on the equipment and different levels of concern are identified by one of the following flag words which precede the precautionary statement.

DANGER

Indicates that a specific hazard is known to exist which through inappropriate conditions or actions will cause:

- Severe or fatal personal injury
- Substantial property damage.

WARNING

Indicates that a specific hazard is known to exist which through inappropriate conditions or actions may cause:

- Severe personal injury
- Substantial property damage.

CAUTION

Indicates that a potential hazard may exist which through inappropriate conditions or actions will or can cause:

- Minor injury
- Property damage.

Indicates precautions or prudent use recommendations that should be used in the operation of the ultrasound system, specifically:

- Use of the ultrasound system as a prescription device, under the order of a physician
- Maintaining an optimum system environment
- Using this Manual
- Notes to emphasize or clarify a point.

Hazard Symbols

Icon Description

Potential hazards are indicated by the following icons:

Icon	Potential Hazard	Usage	Source
Biological Hazard	• Patient/user infection due to contaminated equipment.	• Cleaning and care instructions • Sheath and glove guidelines	ISO 7000 No. 0659
Electrical Hazard	• Electrical micro-shock to patient, e.g., ventricular fibrillation initiated. • Electrical micro-shock to patient/user.	• Probes • ECG • Connections to back panel	
Moving Hazard	• Console, accessories or optional storage devices fall on patient, user, or others. • Collision with persons or objects results in injury while maneuvering or during system transport. • Injury to user from moving the console.	• Moving • Using brakes • Transporting	
Acoustic Output Hazard	• Patient injury or tissue damage from ultrasound radiation.	• ALARA, the use of acoustic output following the **a**s **l**ow **a**s **r**easonably **a**chievable principle	
Explosion Hazard	• Risk of explosion if used in the presence of flammable anesthetics.	• Flammable anesthetic	
Smoke & Fire Hazard	• Patient/user injury or adverse reaction from fire or smoke. • Patient/user injury from explosion and fire.	• Replacing fuses • Outlet guidelines	
Non–Ionizing Radiation	• Console failure, erratic operation or output error due to RF interference.	• RF	IEC 878 No. 03-04

Table 2–1. Potential Hazards

Important Safety Considerations

The following topic headings (*Patient Safety*, and *Equipment and Personnel Safety*) are intended to make the equipment user aware of particular hazards associated with the use of this equipment and the extent to which injury can occur if precautions are not observed. Additional precautions may be provided throughout the manual. The equipment user is obligated to be familiar with these concerns and avoid conditions that could result in injury.

Patient Safety

Related Hazards

WARNING The concerns listed can seriously affect the safety of patients undergoing a diagnostic ultrasound examination.

Patient identification Always include proper identification with all patient data and verify the accuracy of the patient's name or ID numbers when entering such data. Make sure correct patient ID is provided on all recorded data and hard copy prints. Identification errors could result in an incorrect diagnosis.

Diagnostic information Equipment malfunction or incorrect settings can result in measurement errors or failure to detect details within the image. The equipment user must become thoroughly familiar with the equipment operation in order to optimize its performance and recognize possible malfunctions. Applications training is available through the local GE representative. Added confidence in the equipment operation can be gained by establishing a quality assurance program.

Mechanical hazards Damaged probes or improper use and manipulation of intracavitary probes can result in injury or increased risk of infection. Inspect probes often for sharp, pointed, or rough surface damage that could cause injury or tear protective barriers. Never use excessive force when manipulating intracavitary probes. Become familiar with all instructions and precautions provided with special purpose probes.

Related Hazards (cont'd)

Electrical Hazard

A damaged probe can also increase the risk of electric shock if conductive solutions come in contact with internal live parts. Inspect probes often for cracks or openings in the housing and holes in and around the acoustic lens or other damage that could allow liquid entry. Become familiar with the probe's use and care precautions outlined in *Probes and Biopsy*.

Acoustic Output Hazard

Ultrasound energy, even at diagnostic levels, is capable of damaging sensitive tissues if adequate precautions are not followed. The wrong combination of equipment settings, probe positioning, and tissue type can result in injury. Please become thoroughly familiar with equipment controls that affect acoustic output levels as well as the output display.

Follow the principle of **a**s **l**ow **a**s **r**easonably **a**chievable (ALARA) when scanning a patient. During each ultrasound examination, the clinical user is expected to weigh the medical benefit of the diagnostic information obtained against the risk of potential harmful effects. Once an optimal image is achieved the need for increasing acoustic output or prolonging the exposure cannot be justified.

Training

It is recommended that all users receive proper training in applications before performing them in a clinical setting. Please contact the local GE representative for training assistance. ALARA training is provided by GE Application Specialists.

Equipment and Personnel Safety

Related Hazards

WARNING

This equipment contains dangerous voltages that are capable of serious injury or death.

There are no user serviceable components inside the console. Refer all servicing to qualified service personnel only.

DANGER

The concerns listed below can seriously affect the safety of equipment and personnel during a diagnostic ultrasound examination.

Explosion Hazard

Risk of explosion if used in the presence of flammable anesthetics.

Electrical Hazard

To avoid injury:

- Do not remove protective covers. No user serviceable parts are inside. Refer servicing to qualified service personnel.
- To assure adequate grounding, connect the attachment plug to a reliable (hospital grade) grounding outlet (having equalization conductor ⏚).
- Do not place liquids on or above the console. Spilled liquid may contact live parts and increase the risk of shock.

Smoke & Fire Hazard

The system must be supplied from an adequately rated electrical circuit. The capacity of the supply circuit must be as specified on *3–4*.

Related Hazards (cont'd)

Biological Hazard

For patient and personnel safety, beware of biological hazards while performing invasive procedures. To avoid the risk of disease transmission:

- Use protective barriers (gloves and probe sheaths) whenever possible. Follow sterile procedures when appropriate.
- Thoroughly clean probes and reusable accessories after each patient examination and disinfect or sterilize as needed. Refer to *Probes and Biopsy* for probe use and care instructions.
- Follow all infection control policies established by your office, department or institution as they apply to personnel and equipment.

CAUTION

Devices containing latex may cause severe allergic reaction in latex sensitive individuals. USA customers should refer to the FDA's March 29, 1991 Medical Alert on latex products.

Device Labels

Label Icon Description

The following table describes the purpose and location of safety labels and other important information provided on the equipment.

Label/Icon	Purpose/Meaning	Location
Identification and Rating Plate	• Manufacturer's name and address • Date of manufacture • Model and serial numbers • Electrical ratings (Volts, Amps, phase, and frequency)	Rear of console near power inlet
Type/Class Label	Used to indicate the degree of safety or protection.	
IP Code (IPX1)	Indicates the degree of protection provided by the enclosure per IEC 529. IPX1 indicates drip proof.	Foot Switch
	Equipment Type BF (man in the box symbol) IEC 878-02-03 indicates B Type equipment having a floating applied part.	Probe connectors and PCG connector
	Equipment Type CF (heart in the box symbol) IEC 878-02-05 indicate equipment having a floating applied part having a degree of protection suitable for direct cardiac contact.	ECG connector and surgical probes
CE 0459	The CE Mark of Conformity indicates this machine conforms with the Council Directive 93/42/EEC	Rear of console
Device Listing/ Certification Labels	Laboratory logo or labels denoting conformance with industry safety standards such as UL or IEC.	Rear of console
"DANGER – Risk of explosion used in..."	The system is not designed for use with flammable anesthetic gases.	
	"CAUTION" The equilateral triangle is usually used in combination with other symbols to advise or warn the user.	Various

Table 2–2. Label Icons

Label Icon Description (cont'd)

Label/Icon	Purpose/Meaning	Location
	"ATTENTION – Consult accompanying documents" is intended to alert the user to refer to the operator manual or other instructions when complete information cannot be provided on the label.	Various
	"CAUTION – Dangerous voltage" (the lightning flash with arrowhead) is used to indicate electric shock hazards.	
	"Mains OFF" Indicates the power off position of the mains power switch.	Rear of system, adjacent to mains switch
	"Mains ON" Indicates the power on position of the mains power switch.	
	"ON" Indicates the power on position of the power switch. **CAUTION:** This Power Switch **DOES NOT ISOLATE** Mains Supply**.**	Adjacent to On-Off/Standby Switch
	"Off/Standby" Indicates the power off/standby position of the power switch. **CAUTION:** This Power Switch **DOES NOT ISOLATE** Mains Supply.	
	"Protective Earth" Indicates the protective earth (grounding) terminal.	Internal
	"Equipotentiality" Indicates the terminal to be used for connecting equipotential conductors when interconnecting (grounding) with other equipment. **CAUTION:** This is only for "**FUNCTIONAL GROUNDING**", NOT "PROTECTIVE EARTH".	Rear of console

Table 2–2. Label Icons (cont'd)

Label Icon Description (cont'd)

Label/Icon	Purpose/Meaning	Location
	Non–Ionizing Electromagnetic Radiation. Used on the equipment to designate ISM Group 2 in accordance with standard CISPR 11.	Rear of console
	NRTL Listing and Certification Mark. Is used to designate conformance to nationally recognized product safety standards. The Mark bears the name and/or logo of the testing laboratory, product category, safety standard to which conformity is assessed and a control number.	Rear of console

Table 2–2. Label Icons (cont'd)

Classifications

Type of protection against electric shock
Class I Equipment (*1)

Degree of protection against electric shock
Type BF Equipment (*2) (Except ECG)
Type CF Equipment (*3) (ECG Only)
Ordinary Equipment
Continuous Operation

***1. Class I EQUIPMENT**

EQUIPMENT in which protection against electric shock does not rely on BASIC INSULATION only, but includes an earth ground. This additional safety precaution prevents exposed metal parts from becoming LIVE in the event of an insulation failure.

***2. Type BF EQUIPMENT**

TYPE B EQUIPMENT with an F-TYPE APPLIED PART
TYPE B EQUIPMENT: EQUIPMENT providing a specified degree of protection against electric shock, with particular regard to allowable LEAKAGE CURRENT.

	Normal Mode	Single fault condition
Patient leakage current	Less than 100 μA	Less than 500 μA

***3. Type CF EQUIPMENT**

EQUIPMENT providing a degree of protection higher than that for TYPE BF EQUIPMENT against electric shock particularly regarding allowable LEAKAGE CURRENTS, and having an F-TYPE APPLIED PART.

	Normal Mode	Single fault condition
Patient leakage current	Less than 10 μA	Less than 50 μA

Classifications (cont'd)

*4. EMC (Electromagnetic Compatibility)

4.1 EMC Performance

All types of electronic equipment may characteristically cause electromagnetic interference with other equipment, either transmitted through air or connecting cables. The term EMC (Electromagnetic Compatibility) indicates the capability of equipment to curb electromagnetic influence from other equipment and at the same time not affect other equipment with similar electromagnetic radiation from itself.

This product is designed to fully comply with the EN60601–1–2 (IEC60601–1–2) in medical electric equipment EMC regulations.

Proper installation following the service manual is required in order to achieve the full EMC performance of the product.

The product must be installed as stipulated in 4.2, Notice upon Installation of Product.

In case of issues related to EMC, please call your service personnel.

CAUTION

Do not use the following devices near this equipment. Use of these devices near this equipment could cause this equipment to malfunction.

- Devices which intrinsically transmit radio waves such as: Cellular phone, radio transceiver, mobile radio transmitter, radio-controlled toys, etc.

Keep power to these devices turned off when near this equipment.

Medical staff in charge of this equipment is required to instruct technicians, patients and other people who may be around this equipment to fully comply with the above regulaion.

Classifications (cont'd)

4.2 Notice upon Installation of Product

1. Use either power supply cords provided by GE Medical Systems or ones designated by GE Medical Systems. Products equipped with a power source plug should be plugged into the fixed power socket which has the protective grounding conductor. Never use any adaptor or converter to connect with a power source plug (i.e. three-prong-to-two-prong converter).
2. Locate the equipment as far away as possible from other electronic equipment.
3. Be sure to use only the cables provided by or designated by GE Medical Systems. Connect these cables following the installation procedures (i.e. wire power cables separately from signal cables).
4. Lay out the main equipment and other peripherals following the installation procedures described in the Option Installation manuals.

4.3 General Notice

1. Designation of Peripheral Equipment Connectable to This Product.

   The equipment indicated on *13–5* can be hooked up to the product without compromising its EMC performance.

   Avoid using equipment not designated in the list. Failure to comply with this instruction may result in poor EMC performance of the product.

Classifications (cont'd)

4.3 General Notice (cont'd)

2. Notice against User Modification

   The user should never modify this product. User modifications may cause degradation in EMC performance.

   Modification of the product includes changes in:

   a. Cables (length, material, wiring, etc.)
   b. System installation/layout
   c. System configuration/components
   d. Securing system parts (cover open/close, cover screwing)

3. Operate the system with all covers closed. If a cover is opened for some reason, be sure to shut it before starting/resuming operation.

   Operating the system with any cover open may affect EMC performance.

Classifications (cont'd)

***5. Patient Environmental Devices**

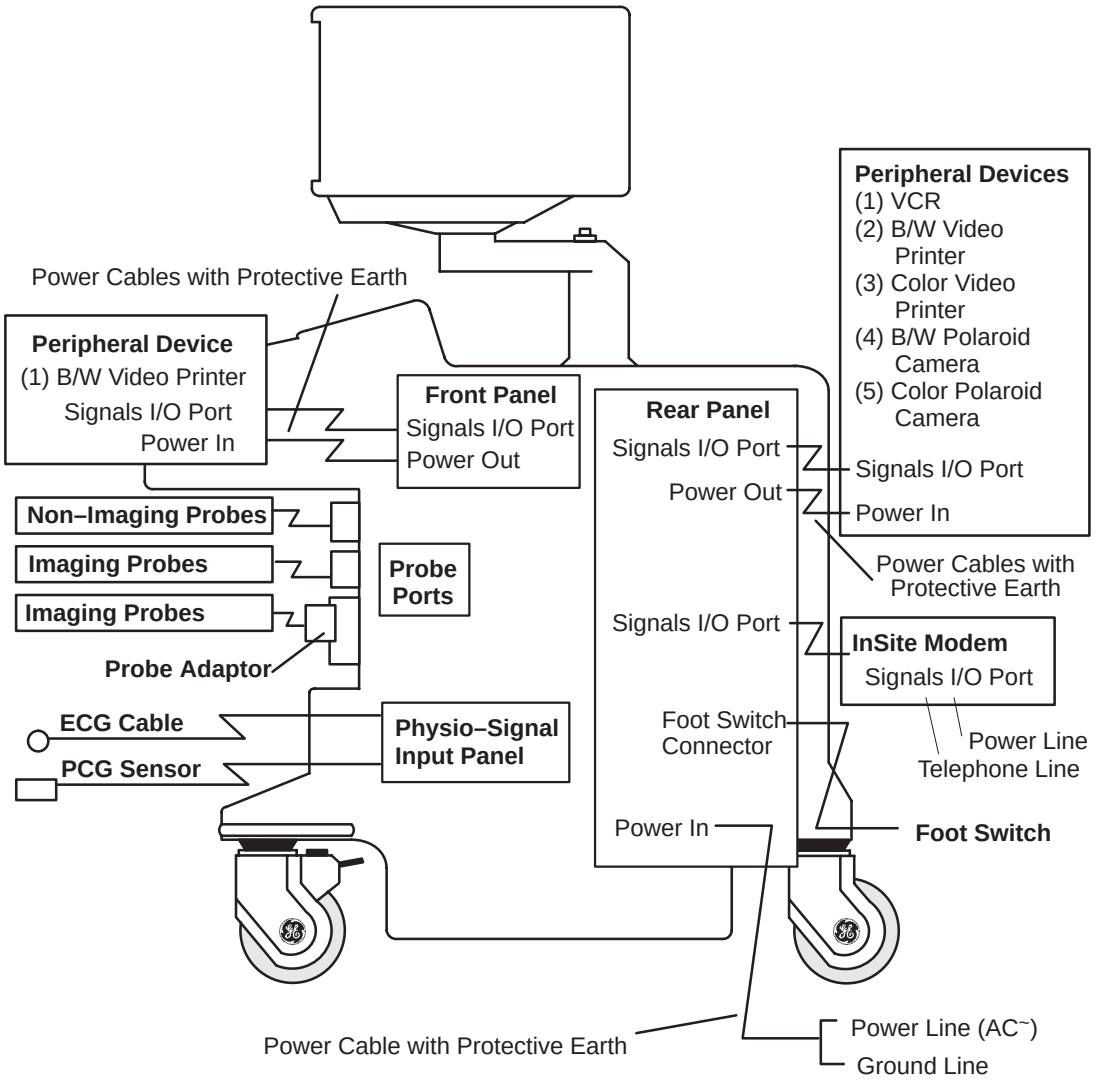


Figure 2–1. Patient Environmental Devices

Classifications (cont'd)

5.1 Acceptable Devices

The devices shown in Figure 2–1 are specified to be suitable for use within the PATIENT ENVIRONMENT.

CAUTION

DO NOT connect any probes or accessories without approval by GE.

Please refer to Peripheral Devices on *13–5* and Assistance on *16–39* for more details. The devices listed have been tested and verified to be compatible with the LOGIQ™ 400 system.

5.2 Unapproved Devices

CAUTION

The user takes All Responsibility for connecting unapproved devices.

If devices are connected without the approval of GE, the warranty will be **INVALID.**

Any device connected to the LOGIQ™ 400 must conform to one or more of the requirements listed below:

1. IEC 50, IEC 65, IEC 335, IEC 348, IEC 414, IEC 820, IEC 950, IEC 1010–1, ISO 7767, ISO 8185, ISO 8359 or IEC 60601–1.
2. The devices shall be connected to PROTECTIVE EARTH (GROUND).

Acoustic Output

Controls Affecting Output

The potential for producing mechanical or thermal bioeffects is influenced by the controls listed below (refer to *2–18*).

Direct. The **Acoustic Output** control has the most significant effect on Acoustic Output.

Indirect. Indirect effects may occur when adjusting the controls listed on *2–18*.

Always observe the output display for possible effects.

Best practices while scanning

Hints

- Raise the Acoustic Output **only** after attempting image optimization with controls that have **no** affect on Acoustic Output, such as **Gain** and **TGC**.

NOTE: Refer to the Optimization sections of the Modes chapter for a complete discussion of each control.

WARNING

Be sure to have read and understood control explanations for each Mode intended to be used before attempting to adjust the Acoustic Output control or any control that can affect Acoustic Output.

Acoustic Output Hazard

Use the minimum necessary output to get the best diagnostic image or measurement during an examination. Begin the exam with the probe that provides an optimum focal depth and penetration.

Best practices while scanning (cont'd)

Controls

Mode	Control	Affect	Default Setting
All	Acoustic Output	Direct. Significant	The middle setting is a factory preset determined to be a reasonable setting for all exams. Use presets to set the output preferred by scan mode and exam combination.
B	Focus Comb	Indirect. Minor	Off.
B/M/CFD	Depth (FOV)	Indirect. Minor	Probe-dependent operator preset.
B/M	Focal Zone Position and Number	Indirect. Minor	Probe-dependent system preset.
B/CFD	Scan Area	Indirect.	Off.
Doppler	M/D Cursor	Indirect. Minor	Off.
Doppler	Doppler Sample Volume Gate Length	Indirect. Minor	Application-dependent system preset.
Doppler	Velocity Scale	Indirect. Minor	Application-dependent operator preset.
PWD/CFD	Freq. Hi/Low	Indirect. Minor	Low.
CFD	Scan Area	Indirect. Minor	Off.
B/M/CFD	Zoom	Indirect. Minor	Off.

Table 2–3. Controls Affecting Acoustic Output

Acoustic Output Default Levels

In order to assure that an exam does not start at a high output level, the LOGIQ™ 400 initiates scanning at a reduced default output level. This reduced level is preset programmable and depends upon exam category, application preset and probe selected. It takes effect when the system is powered on or **New Patient** is selected.

Warning Label Locations

Overview

LOGIQ™ 400 warning labels are provided in seven different languages (English, Japanese, German, French, Italian, Portuguese, Spanish, Swedish, Danish, Russian, Greek and Turkish).

Monitor Labels

A temporary label is placed on the monitor face to warn not to move the monitor support arm without the monitor attached. This label is removed after installation of the monitor.

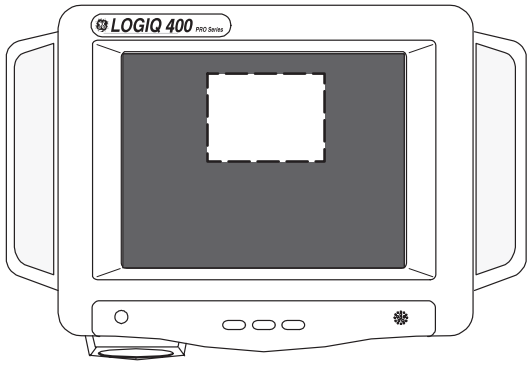
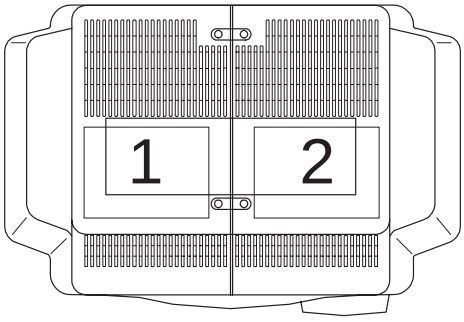
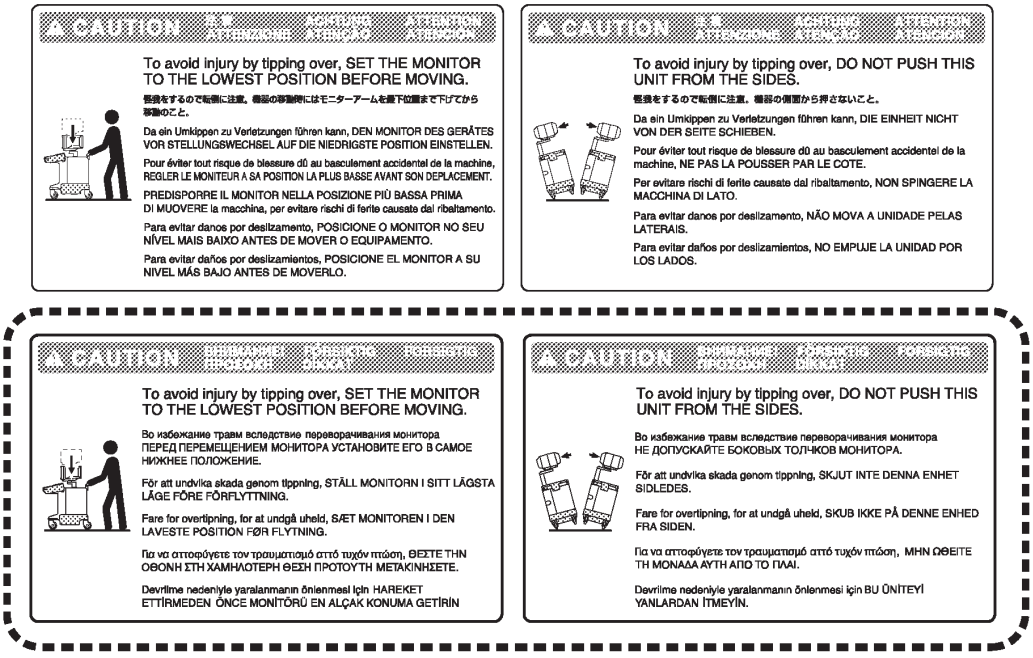


Figure 2–2. Temporary Warning Label and Location

Monitor Labels (cont'd)

Two caution labels are found on the back of the monitor. One warns to only move the console with the monitor in its lowest position; the second warns not to push the console from the side.



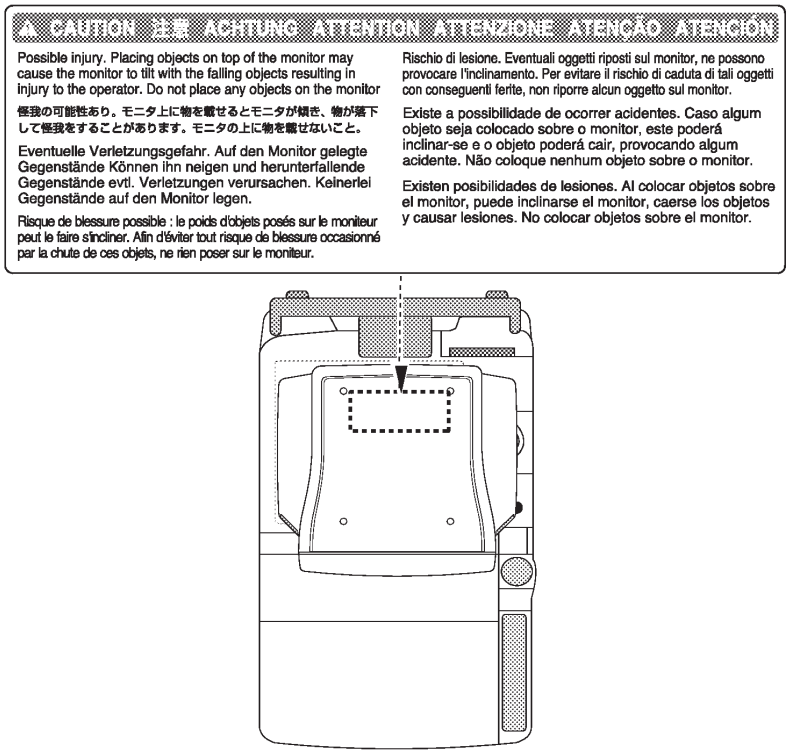


Labels including English, Russian, Swedish, Danish, Greek, and Turkish [supplied with European Console]

Figure 2–3. Lowering Monitor Caution Labels and Locations

Monitor Labels (cont'd)

One caution label is found on the top of the monitor.



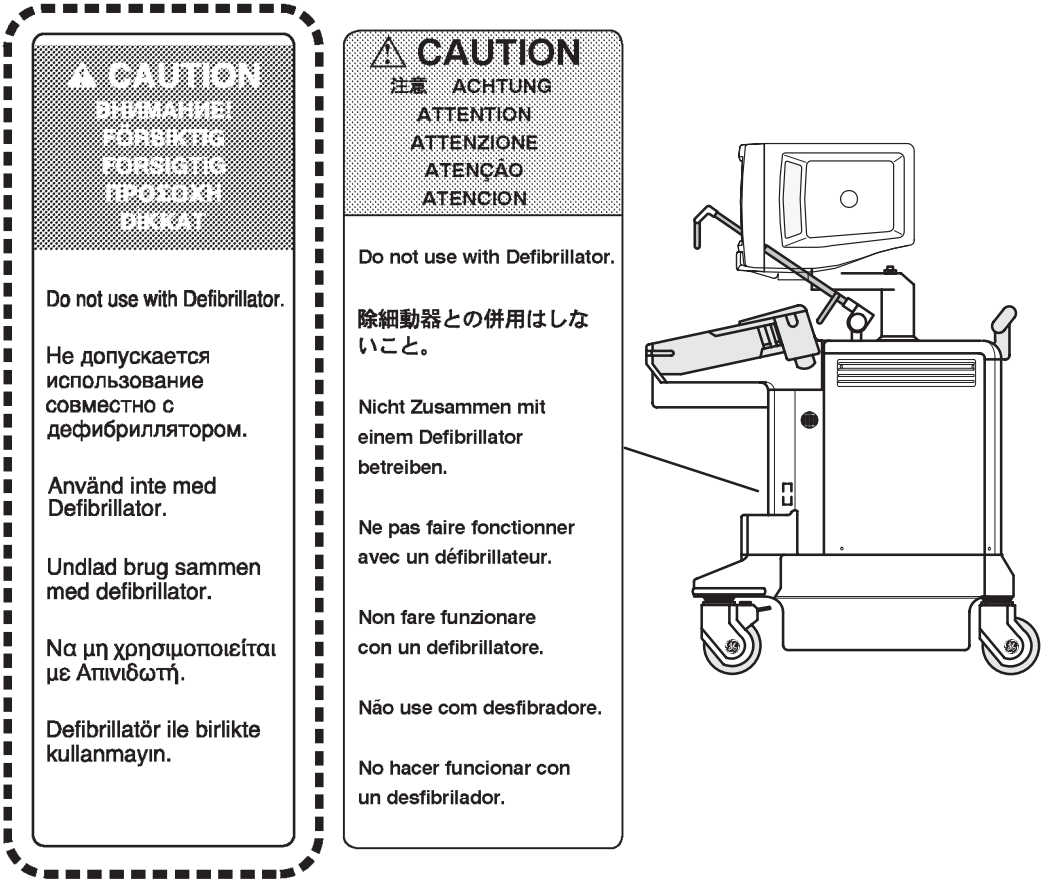
Labels including English, Russian, Swedish, Danish, Greek, and Turkish [supplied with European Console]

Figure 2–4. Top of Monitor Caution and Location

Console Labels

Labels found on the back and side of the console will either be translated to the twelve languages or be specific to the region.

Defibrillator Caution



Labels including English, Russian, Swedish, Danish, Greek, and Turkish [supplied with European Console]

Figure 2–5. Defibrillator Label Location

Ground Point

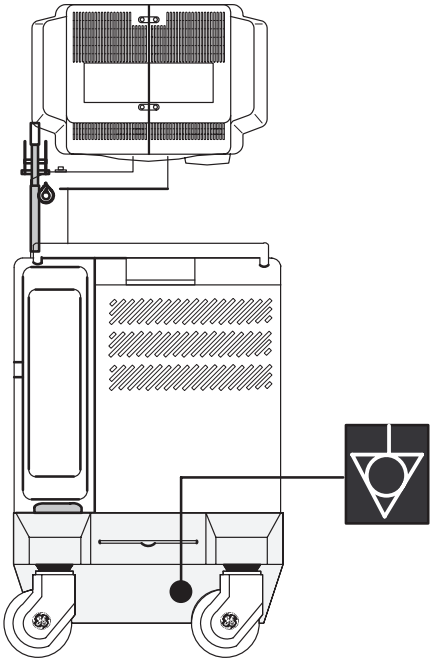


Figure 2–6. Signal Ground Point Location and Label

CAUTION This is only for **“FUNCTIONAL GROUNDING”, NOT “PROTECTIVE EARTH”.**

Regulatory Labels (European Systems)

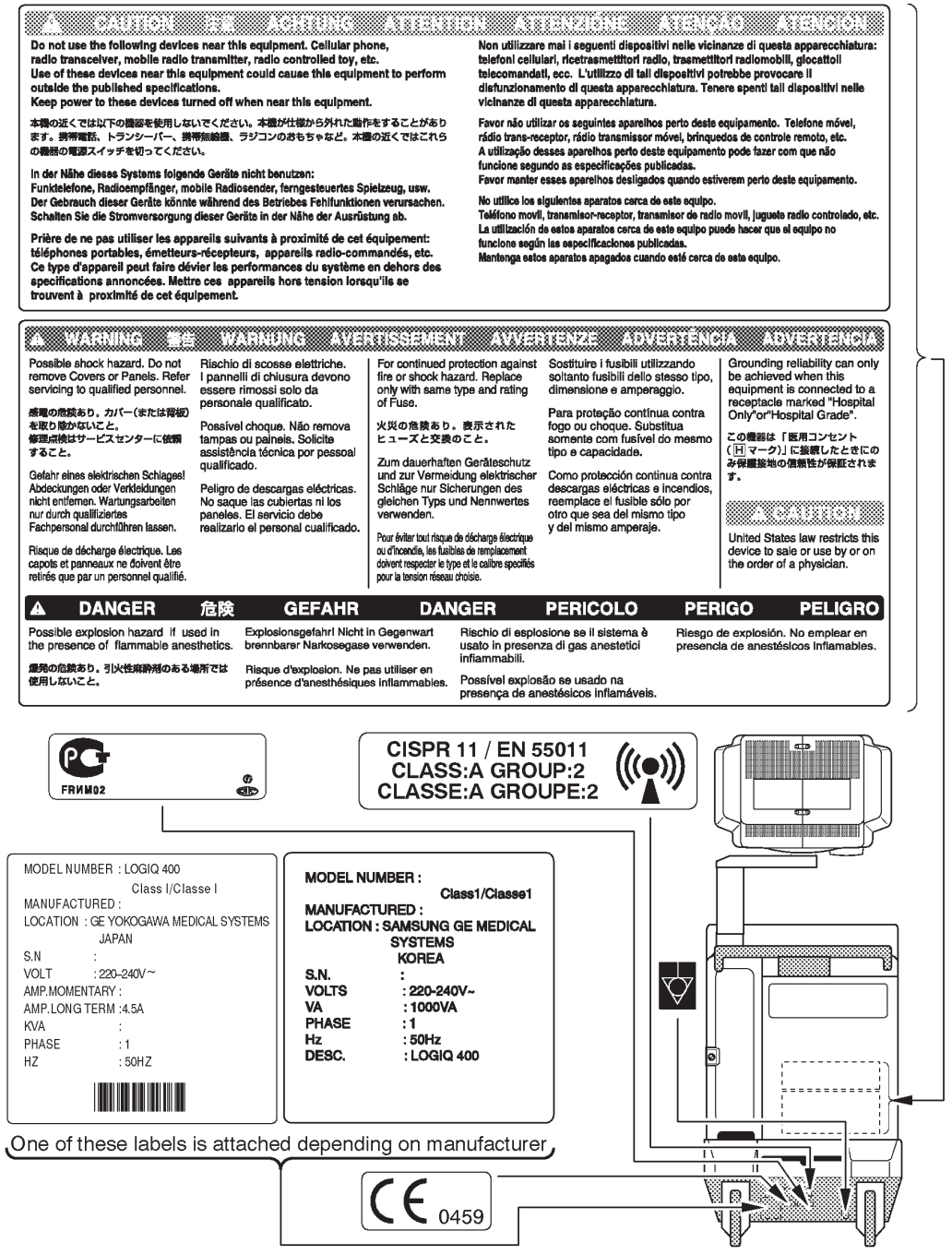


Figure 2–7. Regulatory Label Location (European)

Regulatory Labels (European Systems) (cont'd)

Labels including English, Russian, Swedish, Danish, Greek, and Turkish [supplied with European Console]

Figure 2–8. Regulatory Label Location (European) (cont'd)

Regulatory Labels (American Systems)

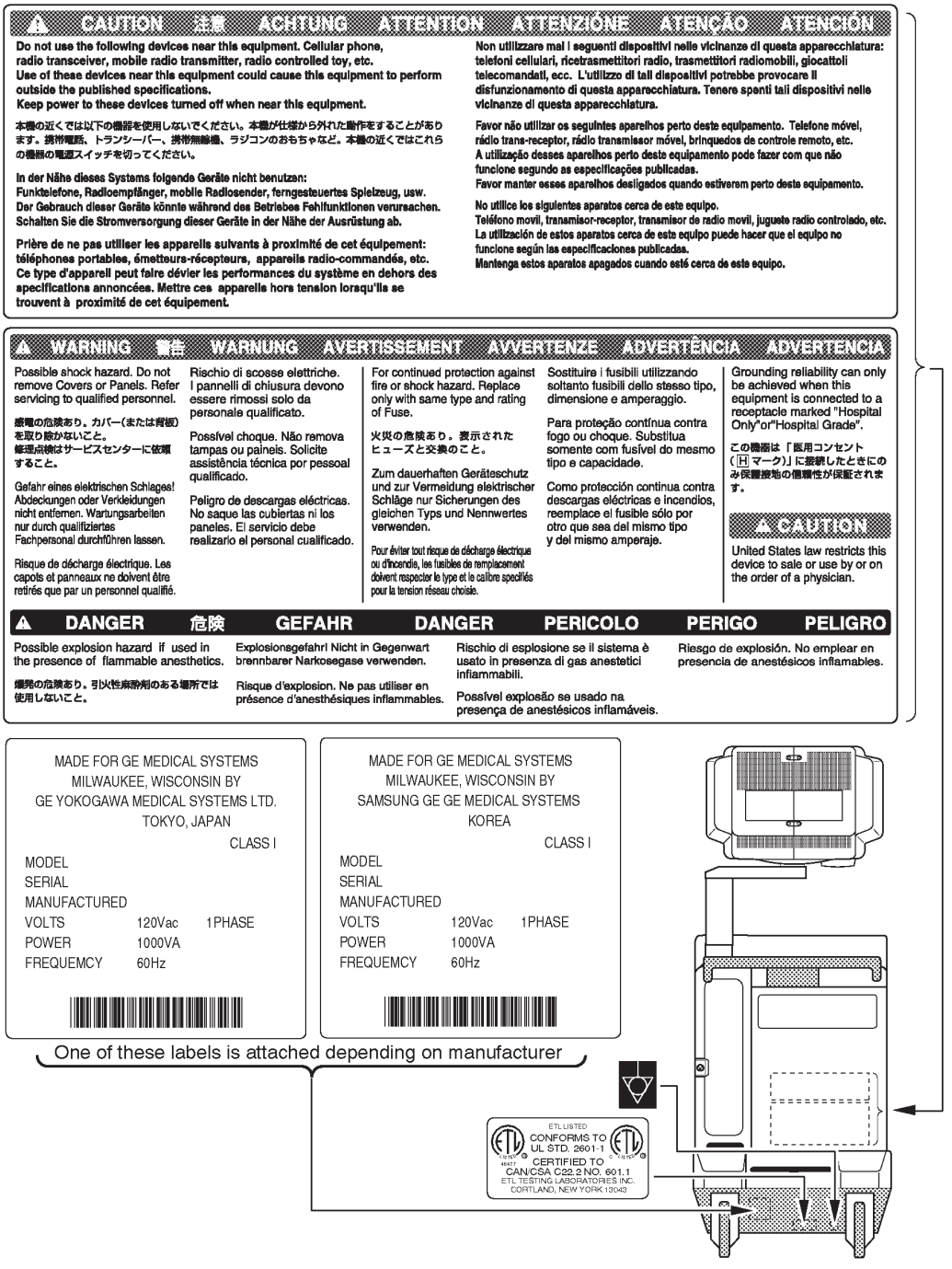


Figure 2–9. Regulatory Label Location (Americas)

Site Requirements

Introduction

Only qualified physicians or sonographers should perform ultrasound scanning on human subjects for medical diagnostic reasons. Request training, if needed.

Do not attempt to install the system alone. General Electric, Affiliate, or Distributor Field Engineers and Application Specialists will install and setup the system. Refer to Who To Contact on *1–8*.

The LOGIQ™ 400 does not contain any operator serviceable internal components. Ensure that unauthorized personnel do not tamper with the unit.

Perform regular preventive maintenance. Refer to *16–11* for maintenance instructions.

Maintain a clean environment. Turn off the system circuit breaker before cleaning the unit. Refer to *16–12* for cleaning instructions.

Never set liquids on the unit to ensure that liquid does not drip into the control panel or unit.

Before the system arrives

NOTICE

This medical equipment is approved, in terms of the prevention of radio wave interference, to be used in hospitals, clinics and other institutions which are environmentally qualified. The use of this equipment in an inappropriate environment may cause some electronic interference to radios and televisions around the equipment. This equipment can be used in residential areas only under the supervision of physicians or qualified technicians.

Ensure that the following is provided for the new system:

- A separate power outlet with a 15 amp circuit breaker for 120 VAC (USA) or 7.5 amp circuit breaker for 220–240 VAC (Europe, Latin America).
- Take precautions to ensure that the console is protected from electromagnetic interference.

  Precautions include:

  - Operate the console at least 15 feet away from motors, typewriters, elevators, and other sources of strong electromagnetic radiation.
  - Operation in an enclosed area (wood, plaster or concrete walls, floors and ceilings) helps prevent electromagnetic interference.
  - Special shielding may be required if the console is to be operated in the vicinity of radio broadcast equipment.

Environmental Requirements

The system should be operated, stored, or transported within the parameters outlined below. Either its operational environment must be constantly maintained or the unit must be turned off.

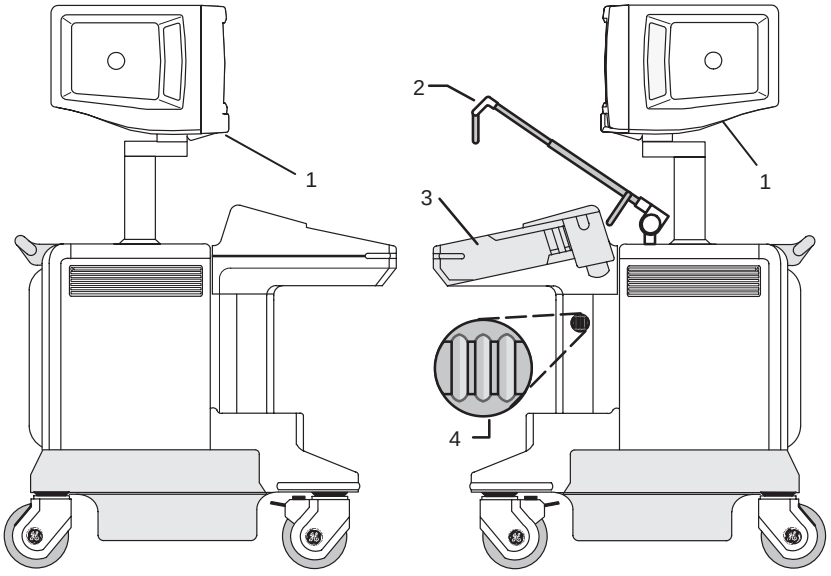
	Operational	**Storage**	**Transport** (<16 hrs.)
Temperature	10°- 40° C 50°- 104° F	–10°- 60° C 14°- 140° F	–40°- 60° C –40°- 140° F
Humidity	30-85% non-condensing	30-90% non-condensing	30-90% non-condensing
Pressure	700-1060hPa	700-1060hPa	700-1060hPa

Table 3–1. System Environmental Requirements

Console Overview

Console graphics

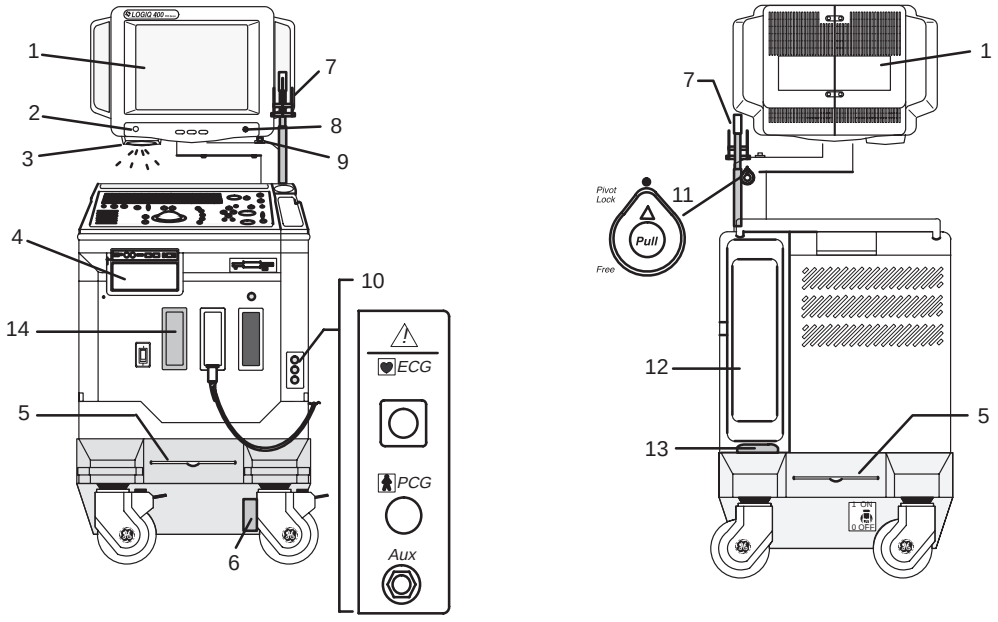
The following are illustrations of the console:



1 Monitor
2 Optional Probe Cable Holder (wire holder standard for Americas' systems)
3 Probe and Gel Bottle Holder (Removable for Cleaning)
4 Optional Cable Clipper for Probe Cable

Figure 3–1. LOGIQ™ 400 System (right and left side views)

Console graphics (cont'd)



1 Monitor
2 Task Light Switch
3 Task Light
4 Optional B/W Video Page Printer
5 Air Filter (front and back of system)
6 Power Supply Air Filter
7 Optional Probe Cable Holder (wire holder standard for Americas' systems)
8 VCR Microphone
9 Release Button—to raise and lower video monitor
10 Optional Physiological Input Panel
11 Swivel Lock on Video Monitor Arm
12 Peripheral Cable Access Panel Door
13 Cable Access Channel
14 Optional Third Probe Port

Figure 3–2. LOGIQ™ 400 System (front and back views)

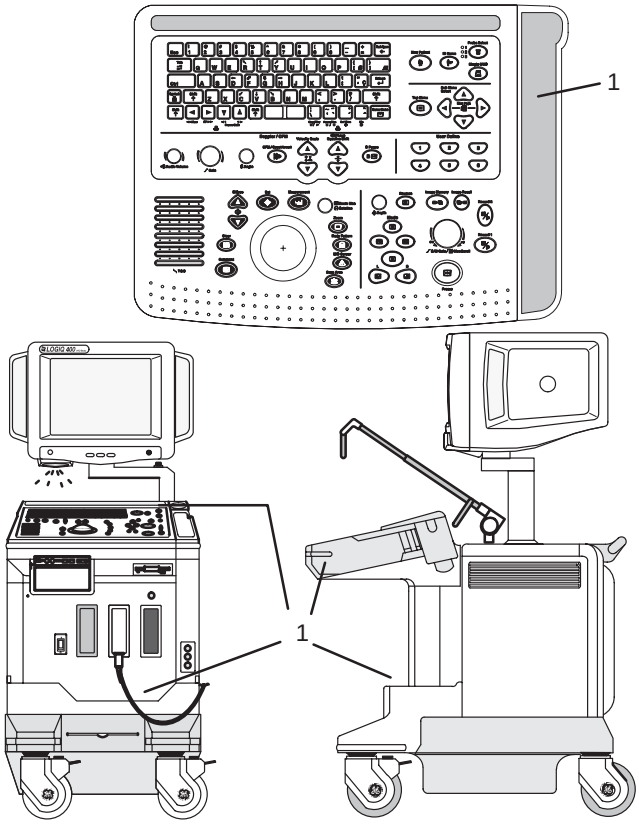
External disk drive

The external MOD drive is a 3.5 inch 128MB/230MB MOD drive located below the keyboard.

It can be used to perform software upgrades, image archiving (option) and service diagnostics.

Storage areas

Several convenient storage areas are provided within the console as shown by the shaded areas in Figure 3–3. Use them to store gel, options, probe cables, accessories, etc.



1 Storage

Figure 3–3. Storage Areas

Peripheral/Accessory Connection

Peripheral/Accessory Connector Panel

LOGIQ™ 400 peripherals and accessories can be properly connected using the rear connector panel located behind the rear door. Only the B/W Page Printer (UP-890) can be connected to the front accessory panel.

Located on the rear panel are video input and output, audio input and output, camera expose, foot switch, power and control connections for VCR, printer, MIC and service tools. See Figure 3–5.

CAUTION

Each outer (case) ground line of peripheral/accessory connectors are **Earth Grounded**.

Signal ground lines are **Not Isolated**, except the Service Port.

All of the signal lines (including the signal ground) of the Service Port are **Isolated.**

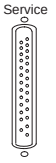
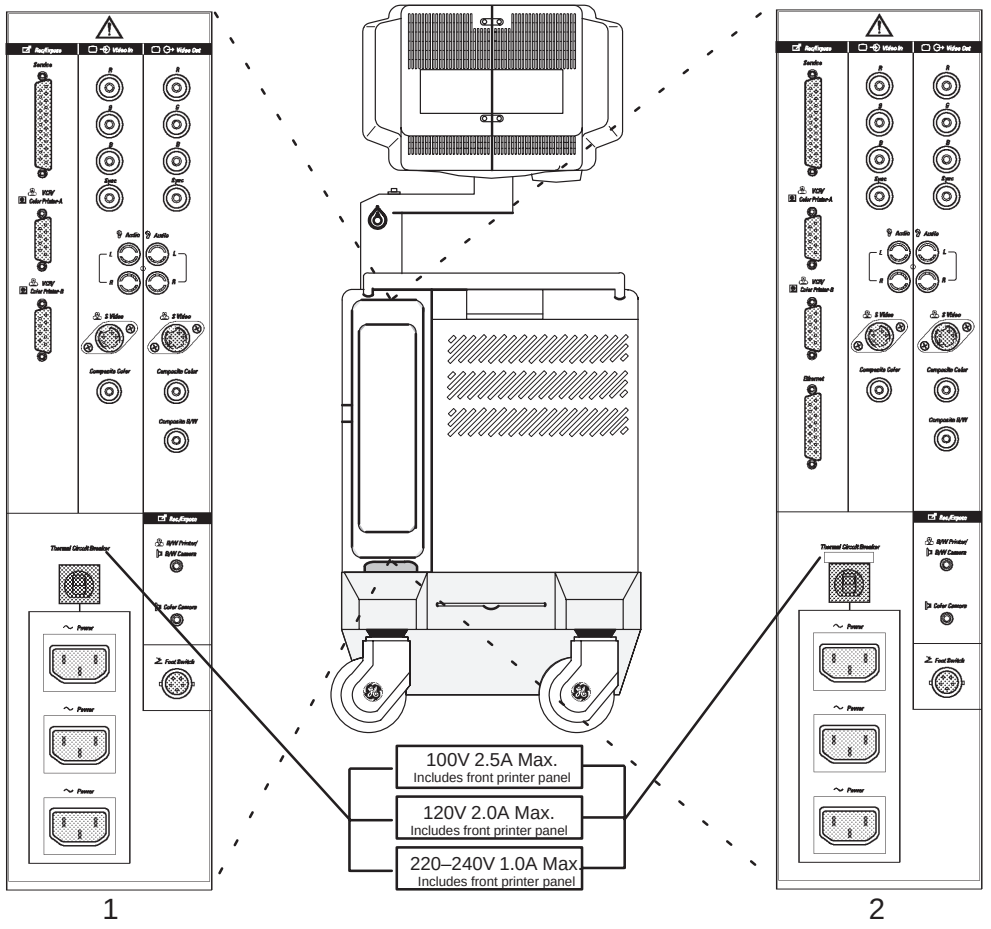


Figure 3–4. Service Port

CAUTION

Use only approved probes, peripherals or accessories.

Peripheral/Accessory Connector Panel (cont'd)

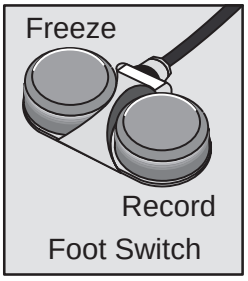


1 Old Rear Panel

2 New Rear Panel

Figure 3–5. Peripheral/Accessory Connector Panel

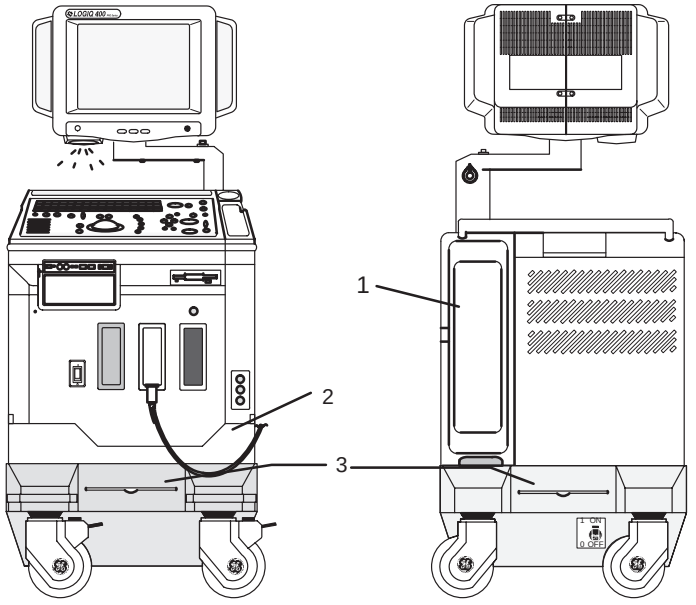
Foot Switch (option)



Use only the recommended optional multi-functional Foot Switch in parallel with or as an alternative to the **Freeze** and **Record 1** controls to:

- Freeze a real-time image (left switch).
- Send an image to the hard copy device (right switch).

The Foot Switch connection is located at the back of the console on the left-hand side of the back panel.



1 Accessory Panel for Foot Switch Connector
2 Store Foot Switch Here
3 Console Air Filter Screen

Figure 3–6. Foot Switch Storage and Connectors

Other Peripherals/Accessories (options)

Refer to *Chapter 13 (Recording Images)* of this manual for more information.

System Positioning/Transporting

Moving the System

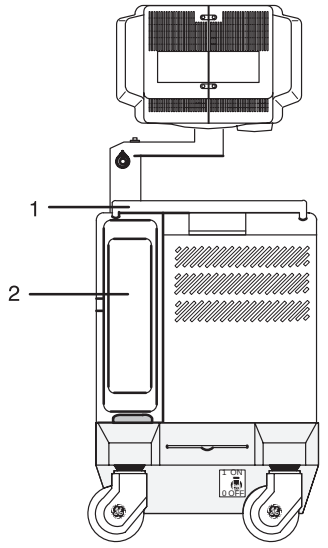
When moving or transporting the system, follow the precautions below to ensure the maximum safety for personnel, the system, and other equipment.

Before moving the system:

1. Turn the system power switch off.
2. Unplug the power cord.
3. All cables from off-board peripheral devices (IIE camera, external printer, VCR, etc.) must be disconnected from the console.
4. Ensure that no loose items are left on the console.
5. Loop the cord around the handle on the back of the system or wrap the cord in a bundle and store it behind the rear storage panel.

To prevent damage to the Power Cord, **DO NOT** pull excessively on the cord or make sharp bends while wrapping.

Moving the System (cont'd)



1 Handle
2 Storage Area Behind Door

Figure 3–7. Location of Storage Area

6. Connect all probes to be used while off site. Ensure that probe cables are out of the way from the wheels and not protruding beyond the console.

NOTE: Store all probes that are intended to be used, but not connected to the system, securely in the front storage area.

7. Store all other probes in their original cases or in soft cloth or foam to prevent damage.
8. Store sufficient gel, optical disks, and other essential accessories in the provided space.
9. Adjust the monitor to its lowest position possible. Ensure that the monitor arm is locked in place.
10. Unlock the front wheels.

Moving the System (cont'd)

When moving the system:

1. Always use the rear handle grips to move the system.
2. Take extra care when moving the system long distances and on inclines. Ask for help if necessary.

   Avoid ramps that are steeper than ten degrees to avoid tipping over the system.

NOTE: Wheel chair ramps are usually less than five degrees.

Utilize additional care and personnel when moving on steep incline (>5°) or loading into a vehicle for transport.

NOTE: ***DO NOT*** *attempt to move the console using any cables or fixtures, such as the probe connectors.*

3. Use the brake, located on the bottom of the system in the front, when necessary.
4. Do not let the system strike walls or door frames.
5. Use extra care when crossing door or elevator thresholds.
6. Once the destination is reached, lock the wheels.

CAUTION

The system weighs approximately 145 kg (320 lbs). To avoid possible injury and equipment damage:

- Be sure the pathway is clear.
- Limit movement to a slow careful walk.
- Use two or more persons to move the system on inclines or long distances.

Transporting the System

Use extra care when transporting the system using vehicles. In addition to the instructions used when moving the system (refer to *3–12*), do the following:

1. Only use vehicles that are designed for transport of the LOGIQ™ 400 system.
2. Load and unload the system to a vehicle parked on a level surface.
3. Ensure that the transporting vehicle can handle the weight of the system plus the passengers.
4. Ensure that the load capacity of the lift (a minimum of 180 kg [397 lbs] is recommended) is capable of handling the weight of the system.
5. Ensure that the lift is in good working order.
6. Secure the system while it is on the lift so that it cannot roll. Use either wood chocks, restraining straps, or other similar types of constraints. Do not attempt to hold it in place by hand.

NOTE: Strap the system below its handle so that the system does not break loose.

WARNING

Never ride on the lift with the system. A person's weight coupled with the weight of the system may exceed the load capacity of the lift.

7. Employ 2 to 3 persons to load and unload safely from a vehicle.
8. Load the unit aboard the vehicle carefully and over its center of gravity. Keep the unit still and upright.

NOTE: Do not lay the unit down.

9. Ensure that the system is firmly secured while inside the vehicle. Any movement, coupled with the weight of the system, could cause it to break loose.
10. Secure system with straps or as directed otherwise to prevent motion during transport.
11. Prevent vibration damage by driving cautiously. Avoid unpaved roads, excessive speeds, and erratic stops or starts.

Wheels

Examine the wheels frequently for any obvious defects that could cause them to break or bind.

Front wheels

The front wheels swivel, pivot, and lock.

Back wheels

The back wheels swivel and pivot but do not lock.

NOTE: For the USA version console, the back wheels do not pivot.

Setting the lock

To engage the wheel lock:

Press down on the lock pedal (located at the front of the wheels). The pedal remains depressed.

To release the lock:

Press down on the pedal again. The pedal returns to its normal position.

Powering On the System

Connecting and Using the System

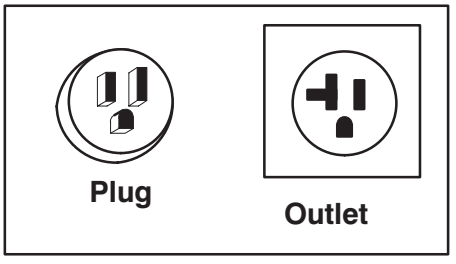
To connect the system to the electrical supply:

1. Ensure that the wall outlet is of the appropriate type.
2. Ensure that the power switch is turned off.
3. Unwrap the power cable. Make sure to allow sufficient slack in the cable so that the plug is not pulled out of the wall if the system is moved slightly.
4. Push the power plug securely into the wall outlet.

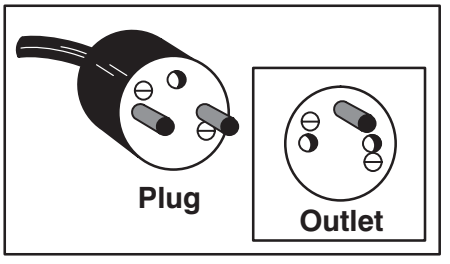
WARNING To avoid risk of fire, the system power must be supplied from a separate, properly rated outlet. See *Site Requirements, Before the system arrives* on *3–4* for rating information.

Under no circumstances should the AC power plug be altered, changed, or adapted to a configuration rated less than specified. Never use an extension cord or adapter plug.

To help assure grounding reliability, connect to a “hospital grade” or “hospital only” grounded power outlet.



120 VAC, 1000 VA
Plug and Outlet Configuration
(USA)



220–240 VAC, 1000 VA
Plug and Outlet Configuration
(Europe)

Figure 3–8. Example Plug and Outlet Configurations

Acclimation Time

After being transported, the unit requires one hour for each 2.5° increment its temperature is below 10° C or above 40° C.

° C	60	55	50	45	40	35	30	25	20	15	10
° F	140	131	122	113	104	95	86	77	68	59	50
hours	8	6	4	2	0	0	0	0	0	0	0

° C	5	0	–5	–10	–15	–20	–25	–30	–35	–40
° F	41	32	23	14	5	–4	–13	–22	–31	–40
hours	2	4	6	8	10	12	14	16	18	20

Table 3–2. System Acclimation Time Chart

Power On/Off Standby

CAUTION

Press the top portion of the **Power On/Off Standby** switch to turn the power on. The circuit breaker, on the rear of the unit, must also be in the on position (see *3–23*).

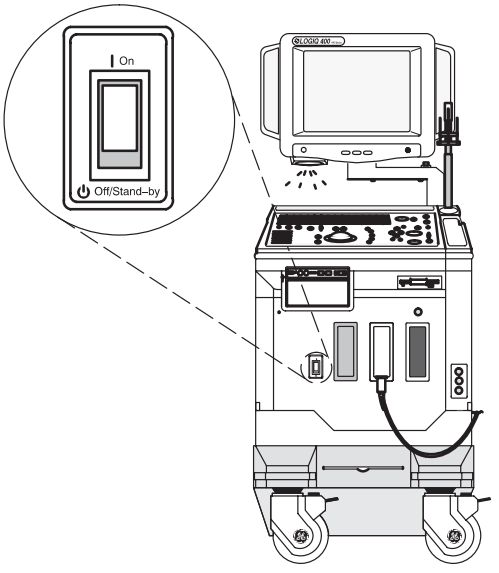
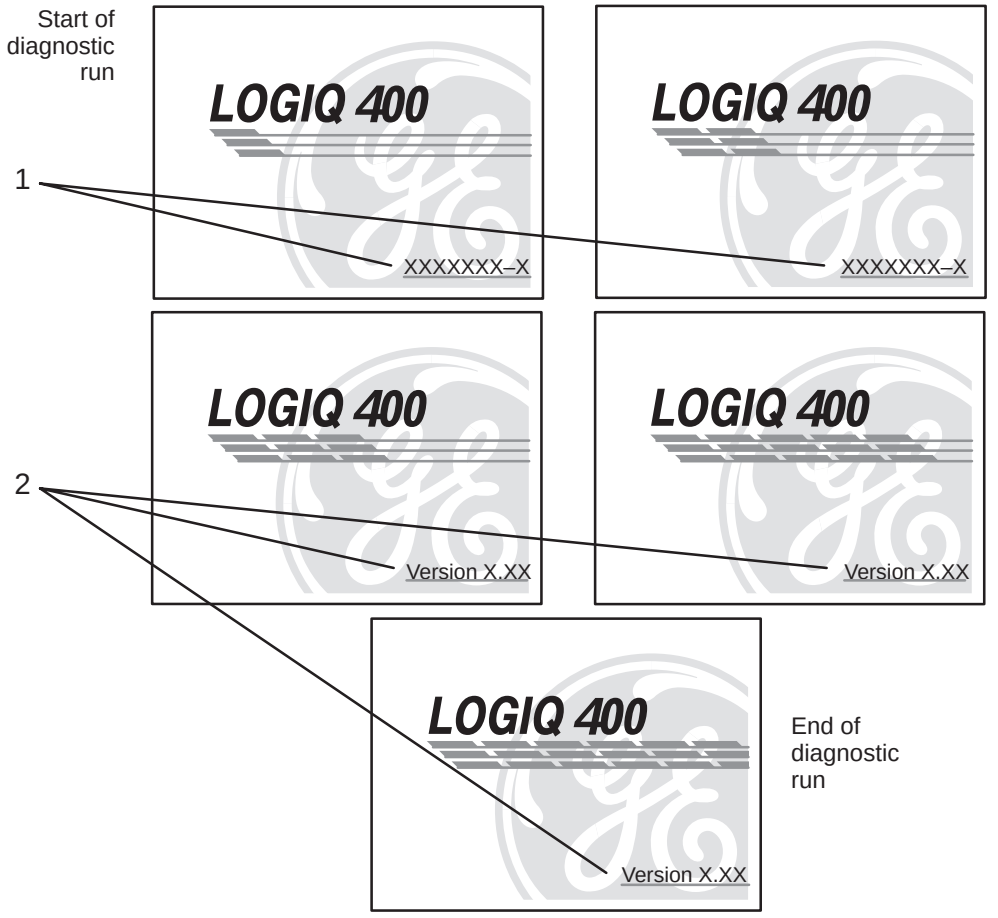


Figure 3–9. Power Switch Location

Power Up Sequence

- The monitor and console power indicator light up.
- The system is initialized. During this time:
  - Two beeps sound during the sequence.
  - All lighted buttons on the keyboard light.
  - System diagnostics run. Its status is reflected on the monitor by the graphics in *Figure 3–10*.



1 Current OBC Assembly Part Number 2 Current Software Version

Figure 3–10. Power Up Graphic Sequence

Power Up Sequence (cont'd)

NOTE: If errors occur, an error message appears at the bottom of the screen. See User Maintenance, Troubleshooting for more information.

Hints

If problems occur, freeze the image and take a picture for reference. This will help if there is a need to call for service.

- Probes are initialized for immediate operation.

NOTE: If no probes are connected, the system goes into standby mode.

- Peripheral devices are activated on power up.

After initialization has been completed, the new patient entry menu will be displayed.

Password Protection

A maximum of 8 personal IDs and associated passwords can be preset in the LOGIQ™ 400 (see *14–60*).

If IDs and passwords have been entered and the Password Ask parameter is on, the following occurs in the power up sequence:

- The message USERID:_____ appears in the middle of the start up sequence.
- Type in a User ID and press **Return**.
- Keyboard lights go out.
- The message PASSWORD:_____ is highlighted.
- Type in the password that corresponds to the User ID and press **Return**.

Password Protection (cont'd)

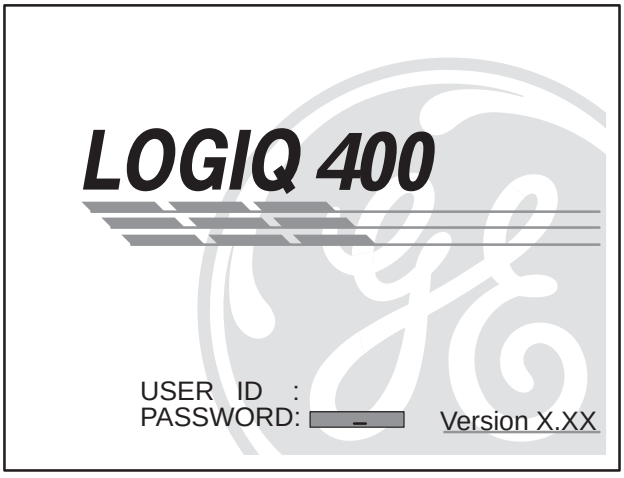


Figure 3–11. System Startup Screen with Password Ask on

If the correct User ID/Password is entered, the system continues with the power up sequence.

If an incorrect User ID/Password is entered, the system allows four additional attempts. After the fifth incorrect entry, the message "Login incorrect" appears. The power up sequence will not continue. The system must be turned off, then on, to begin again.

*NOTE: If User ID/Passwords are registered and the Password Ask function is off, press **Return** at the ID_____ prompt. The system continues the power up sequence.*

Power Off

When switching off the system:

- Move the **ON, OFF/STAND-BY** switch to the OFF position. The message “WARNING: NOW STARTING THE POWER OFF PROCESS” appears at the bottom of the display.
- The LOGIQ™ 400 takes a few seconds to save current scan parameter data in the temporary files to the hard drive before turning the power off.

  During this time a message flashes on the screen:

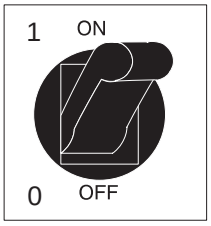
  “Do not pull Power Cable.
  Do not turn off Breaker.”

  Pulling the power cable or turning off the circuit breaker, while the hard drive is working, may corrupt the system operating software on the hard drive.

  If the system has not turned off five minutes after pressing the power switch off, listen for hard drive activity. If there is no hard disk drive activity, the circuit breaker on the bottom of the power supply can be used to turn off the system. Do NOT turn off the circuit breaker while the hard disk is working.
- Disconnect the probes.

  Clean or sanitize all probes as necessary. Store them in their shipping cases to avoid damage.
- If daily maintenance is to be performed, turn off the circuit breaker in the back of the system.

Circuit breaker



The Circuit Breaker is located on the back of the console, at the bottom of the system. **On** supplies main power to all internal systems. **Off** removes main power from all internal systems. The circuit breaker automatically shuts off power to the system in case of a power overload.

If a power overload occurs:

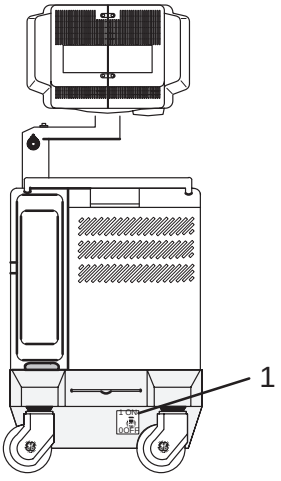
1. Turn off all peripheral devices.
2. Turn off the Main Power Switch to the console.
3. Reactivate the Circuit Breaker switch.

The Circuit Breaker switch should stay in the **On** position; **DO NOT** hold the switch in the **On** position. If the Circuit Breaker switch remains **On**, follow the *Power On* procedure previously described.

*NOTE: If the Circuit Breaker switch does **not** remain in the **On** position or trips again:*

1. Disconnect the Power Cable.
2. Call Service immediately.

***DO NOT** attempt to use the system.*



1 Circuit Breaker

Figure 3–12. Location of Circuit Breaker

Adjusting the Display Monitor

Rotate, tilt, raise and lower the monitor

The monitor position can be adjusted for easy viewing.

- The monitor can be rotated around it's central pivot point.
- The monitor can be tilted for the optimum viewing angle.
- The monitor arm can swing forward or backwards.
- The monitor arm can be raised or lowered for the best viewing height.

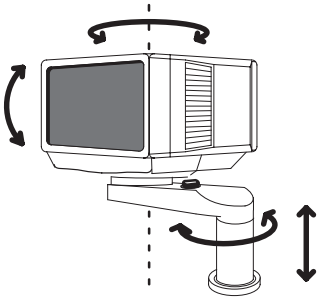
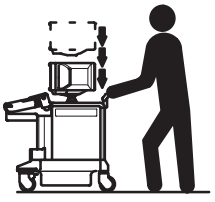


Figure 3–13. Display Monitor Movement

CAUTION

Movement of the monitor swing arm or height adjustment requires the release of the locking mechanism. After an adjustment is made, ensure that the mechanism is locked to prevent unexpected motion.



When moving the LOGIQ™ 400 system, lower the monitor to its lowest possible position to improve stability.

Brightness and Contrast

Adjusting the monitor's contrast and brightness is one of the most important factors for proper image quality. If these controls are set incorrectly, the Gain, TGC, Dynamic Range and even Acoustic Output may have to be changed more often than necessary to compensate.

The proper setup displays a complete gray scale. The lowest level of black should just disappear into the background and the highest white should be bright, but not saturated.

To adjust the Brightness and Contast:

1. Press the monitor's toggle button for brightness and contrast. Confirm that the brightness (or contrast) is displayed on the monitor. If the contrast is displayed, press the toggle button again.
2. Adjust the brightness (or contrast) by pressing the ◀◀ (–) or ▶▶ (+) monitor's adjustment buttons.
3. Select the Set Up Top Menu. From the Set Up Sub-Menus, select Utility. The Utility Menu appears as shown in Figure 3–14.

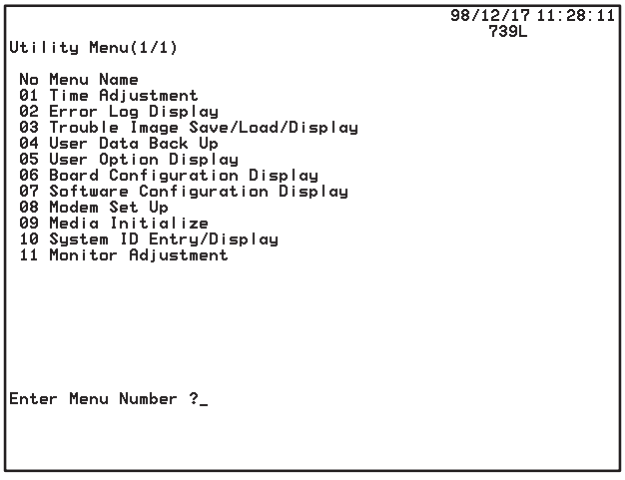


Figure 3–14. Utility Menu

Brightness and Contrast (cont'd)

4. Enter menu number "11" (Monitor Adjustment) in the Utility Menu and press **Return**. The Monitor Adjustment Menu appears as shown in Figure 3–15.

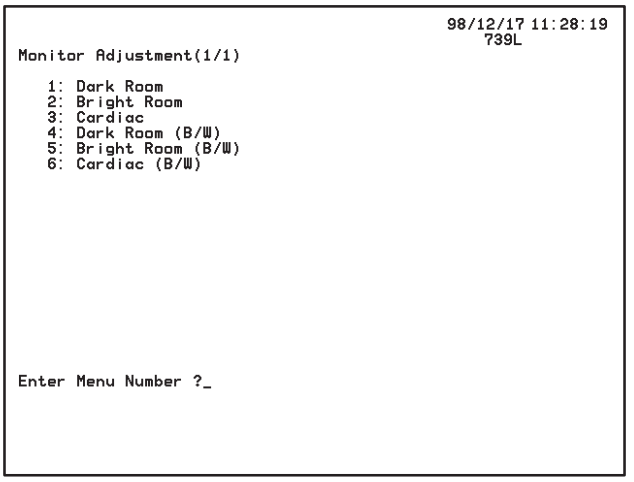


Figure 3–15. Monitor Adjustment Menu

5. Enter the number of a gray scale map for adjustment according to the brightness of the exam room and the exam category and press **Return**.

   1: Dark Room—for a dimly lit room with a color monitor.

   2: Bright Room—for a well lit room with a color monitor.

   3: Cardiac—for a Cardiac Exam with a color monitor.

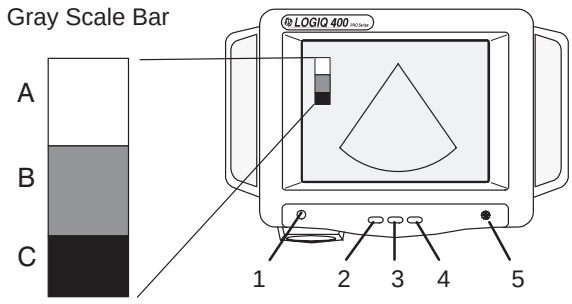
   4: Dark Room (B/W)—for a dimly lit room with a black and white monitor.

   5: Bright Room (B/W)—for a well lit room with a black and white monitor.

   6: Cardiac (B/W)—for a Cardiac Exam with a black and white monitor.

Brightness and Contrast (cont'd)

The adjustment maps' gray scale bar appears on the monitor as shown in Figure 3–16.



1 Task Light Switch
2 Brightness/Contrast Toggle Button
3 Brightness/Contrast Adjustment (–) Button
4 Brightness/Contrast Adjustment (+) Button
5 Microphone

Figure 3–16. Brightness and Contrast

6. Press the ▶▶ (+) monitor adjustment button to the maximum for brightness. Toggle to contrast. Press the ▶▶ (+) monitor adjustment button to the maximum for contrast. Toggle to brightness.
7. Decrease the brightness by degrees by pressing the ◀◀ (–) monitor adjustment button until "**B**" in the gray scale bar is not visible. Toggle to contrast.
8. Decrease the contrast by degrees by pressing the ◀◀ (–) monitor adjustment button until "**A**" in the gray scale bar is not visible.
9. Press the ▶▶ (+) monitor adjustment button to the maximum for brightness again.
10. Decrease the brightness by degrees by pressing the ◀◀ (–) monitor adjustment button until "**C**" in the gray scale bar is not visible.
11. Press the Utility up/down arrow keys to return to the previous scan mode.

Brightness and Contrast (cont'd)

Generally speaking, do not change the controls once they have been set. Once set, the display then becomes the reference for the hard copy device(s).

NOTE: After readjusting the monitor's Contrast and Brightness, readjust all preset and peripheral settings.

Manual Degauss

Degaussing refers to the process of removing magnetic-field effects from the monitor. Operation of the monitor within a magnetic field may adversely effect color purity. Degaussing can be used to correct this problem. The monitor automatically degausses at power on.

To activate the manual degauss:

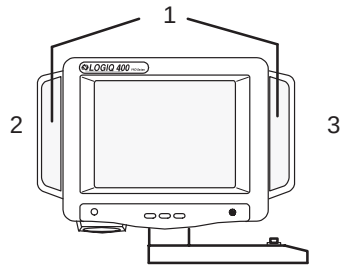
1. Press the ◀◀ (–) or ▶▶ (+) monitor adjustment buttons while the brightness/contrast adjustment indicator is not displayed on the monitor. To cancel the manual degauss, press the ◀◀ (–) or ▶▶ (+) adjustment button again.
2. Press the toggle button for brightness and contrast.
3. Press the ◀◀ (–) or ▶▶ (+) Adjustment button.

NOTE: Monitor degaussing (demagnetizing) is done automatically when the system is turned on.

Speakers

Stereo audio, provided by speakers located on the sides of the Display Monitor, is standard for:

- Audio Doppler operation (left side is blood flow away/right side is blood flow toward)
- Audio playback of videotaped scan sessions
- Audio error notification



1 Speakers
2 Toward
3 Away

Figure 3–17. Display Monitor Speakers

Probes

Introduction

Only use approved probes.

All imaging probes can be plugged into any of the two probe ports. Third probe port is optional.

For more information Refer to the *Probes* chapter.

Selecting a probe

Hints

- Always start out with a probe that provides optimum focal depths and penetration for the patient size and application.
- Begin the scan session using the default Acoustic Output setting for the probe and application.

NOTE: Selecting a new probe unfreezes the image.

Connecting the Probe

Probes can be connected at any time, regardless of whether the console is powered on or off. To ensure that the ports are not active, place the system in the image freeze condition.

To connect a probe:

1. Place the probe's carrying case on a stable surface and open the case.
2. Carefully remove the probe and unwrap the probe cord.

CAUTION

3. **DO NOT** allow the probe head to hang free. Impact to the probe head could result in irreparable damage.
4. Turn the connector locking handle counterclockwise.
5. Align the connector with the probe port and carefully push into place.

Connecting the Probe (cont'd)

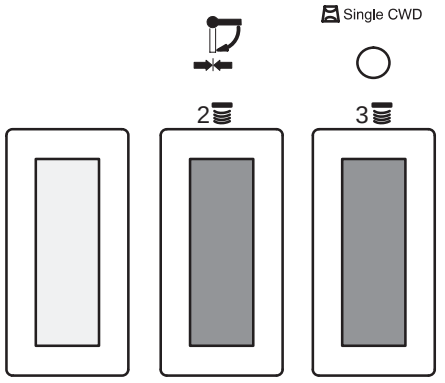


Figure 3–18. Probe Connector Panel

6. Turn the connector locking handle clockwise to secure the probe connector.
7. Carefully position the probe cord so it is free to move and is not resting on the floor.

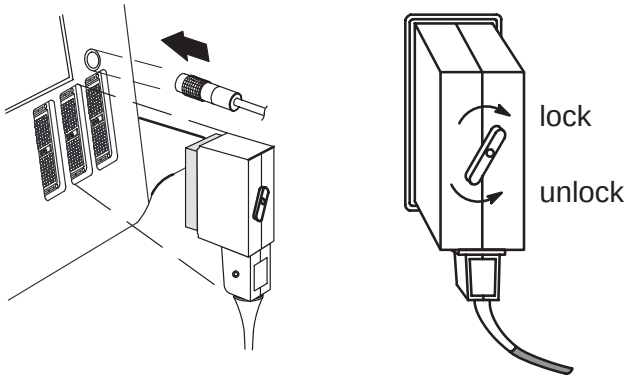


Figure 3–19. Connecting a Probe

Cable Handling

Take the following precautions with probe cables:

- Keep free from wheels
- Do not bend the cable acutely
- Avoid crossing cables between probes.

Activating the Probe

To activate the probe, press the **Probe Select** key that corresponds to the probe port to which the desired probe is connected. The **Single CWD** key is used to activate the dedicated continuous wave Doppler (CWD) probe.

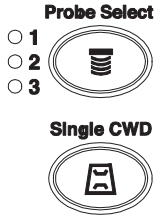


Figure 3–20. Probe Select Keys

The probe activates in the currently selected operating mode. The probe's default settings for the mode and selected application are used automatically.

Probe Name Menu

If the Display Probe Name preset in the Setup/System Parameters page one is ON, a list of names for the probes that are attached to the system can be displayed by pressing the **Probe Select** key once. The desired probe can then be selected from the soft menu or by pressing the **Probe Select** key until the desired probe LED is lit. Press the **Mode Top Menu** key to exit the probe name display.

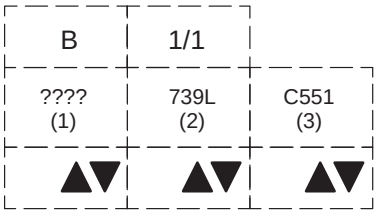


Figure 3–21. Probe Name Menu

Deactivating the Probe

When deactivating the probe, the probe is automatically placed in standby mode.

To deactivate a probe:

- Press the **Freeze** key.
- Gently wipe the excess gel from the face of the probe.
- Carefully slide the probe around the right side of the keyboard, toward the probe holder.
- Ensure that the probe is placed gently in the probe holder.

Disconnecting the Probe

Probes can be disconnected at any time. However, the probe should not be selected as the active probe.

- Move the probe locking handle counterclockwise.
- Pull the probe and connector straight out of the probe port.
- Carefully slide the probe and connector away from the probe port and around the right side of the keyboard.
- Ensure the cable is free.
- Be sure that the probe head is clean before placing the probe in its storage box.

Transporting Probes

Secure the probe in its holder for moving short distances. When transporting a probe a long distance, store it in its carrying case.

Storing the Probe

It is recommended that all probes be stored in the carrying case provided.

- First place the probe connector into the carrying case.
- Carefully wind the cable into the carrying case.
- Carefully place the probe head into the carrying case. **DO NOT** use excessive force or impact the probe head.

Operator Controls

Control Panel Map

Controls are grouped together by function for ease of use. See the callouts for this illustration on the following page.

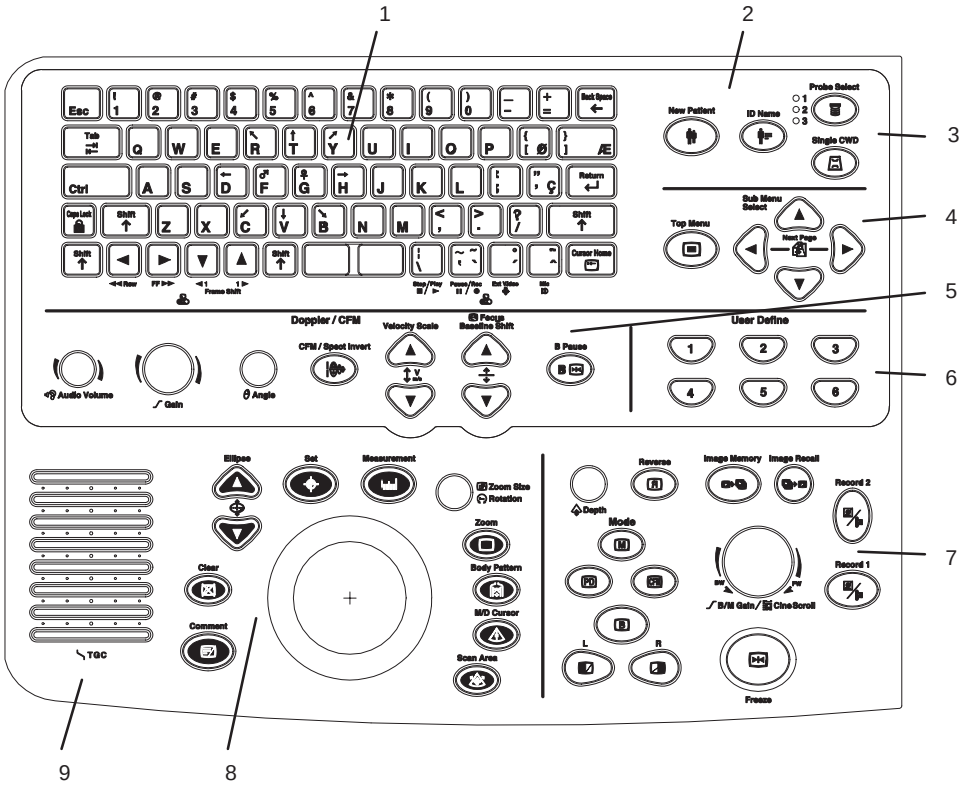


Figure 3–22. Control Panel

Control Panel Map (cont'd)

1. Alphanumeric Keyboard (see *3–35*).
2. Patient Information (see *4–3*).
3. Probe Selection (see *3–30*).
4. Soft Menu (see *3–38*).
5. Doppler CFM (see *5–29* and *5–51*).
6. User Define (see *14–97*).
7. Mode Display Record (see *3–41*).
8. Measurements/Annotations (see *3–43*).
9. TGC and Acoustic Output (see *5–10*).

Key Illumination

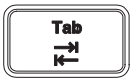
All front panel keys have back lit illumination.

Keyboard

The standard alphanumeric keyboard has some special functions.

The Cursor Home key brings the alphanumeric cursor to the very upper left corner of the available field.

Control is used in conjunction with other keys to activate special keyboard functions.



Tab is used to move forward or backwards through the text one word at a time, or eight characters at a time.

Red

Red Shift is used to activate language-specific and special symbol characters highlighted in red on the keys to the right side of the keyboard. See *6–22* for details.

Blue

For the LOGIQ™ 400, Blue Shift activates the VCR controls on the keyboard for the approved Sony SVO-9500MD. The keys can be used to control the Microphone, Stop, Play, Record and Pause functions. The External Video key displays VCR video on the monitor. Refer to the Advanced Reference Manual.

For the LOGIQ™ 400CL, Blue Shift activates two controls associated with approved Sony SVO-9500MD. The keys can be used to control the Microphone and External Video key to display VCR video on the monitor.

User Define Function

Alphanumeric keys (A~Z and 1~0) can also be used for the User Define Key function. Refer to *14–97* for details.

Soft Menu Control Panel

Additional functionality, not available as a control or key on the front panel, can be found via the Soft Menus. The Soft Menu is displayed on the monitor. Different soft menus appear depending on the mode, special function or calculation package selected.

The Soft Menu consists of **Top Menu Select** and **Sub-Menu Select** keys.

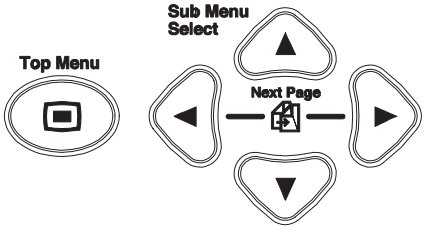


Figure 3–23. Soft Menu Control Keys

Top Menu Organization

The Top Menu Select key toggles the soft menu display on/off or returns to the top menu display from a sub menu.

The default selection is the far left side top menu or the last selection made prior to deactivating the soft menu display. One page of its sub menus is automatically displayed when the top menu is selected by an up/down arrow from the Sub Menu Select keys.

The top menu groups are displayed as follows:

Mode Default	Preset	Set Up	ECG	Archive	DICOM	Auto Seq	CINE

Figure 3–24. Mode Default Top Menu

Top Menu Organization (cont'd)

- Mode Default Menu is the current highest priority active mode. The five possibilities are "B", "M", "PWD", "CWD" and "CFM".
- Preset is for user programmable application and factory exam parameter preset selections.
- Set Up enables the system customization sub-menus.
- ECG (option) is used to adjust the ECG waveform and ECG synchronized scanning.
- Archive is used with the Image Archive option for storing images to MOD.
- DICOM (option) displays sub-menus for DICOM setup.
- Auto Sequence displays the user programmed measurement sequences.
- CINE is used when the image is frozen for review of the accumulated image data.

Four keys on the front panel automatically disable all top menus and display specific sub-menu selections.

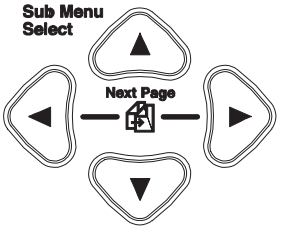
- **Body Pattern** displays the available graphic selections in the sub-menu area.
- **Comment** displays the available selections from the comment library.
- **Measurement** displays the available measurements suitable for the current exam category, image format or individual user sequences.
- **Image Recall** displays information pertaining to images temporarily stored in system memory.

*NOTE: To return functions to the Top-Menus, press **Clear**.*

Sub-Menu Organization

Different Sub-Menus are displayed according to the front panel key pressed or Top Menu selected.

Each selection or parameter in the Sub-Menus relates directly to the Top Menu that is highlighted.



Sub Menu Select keys turn on a sub menu, move through the sub menu selections and pages, change sub menu values or turn on/off sub menu selections.

The up/down arrow keys turn on the sub menu.

The left/right arrow keys move through the menu selections and pages.

The up/down arrow keys change the highlighted selection value or turn the sub menu selection on/off.

Refer to Figure 3–25. The top row shows the top menu selected “B” and the number of pages available 1 of 4.

The second row are the parameter selections available. Below each parameter selection is a value or up/down arrows that may indicate increase/decrease or on/off.

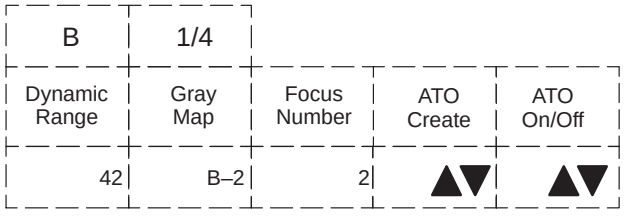
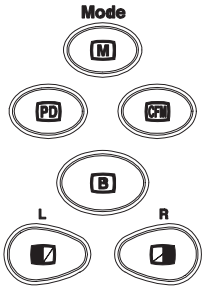


Figure 3–25. B Sub-Menu Organization

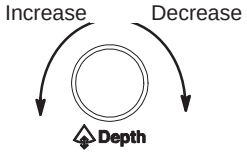
Mode, Display and Record

This group of controls provides various functions relating to the display mode, display orientation, image recording/saving, freeze, gain and cine scroll.



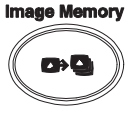
The Mode Controls select the desired display mode or combinations of display modes.

During dual display modes the **L** and **R** keys activate the Left or Right displayed image.



The Depth knob controls the image display depth.

The Reverse key toggles the left/right orientation of the scan image.



The Image Memory key stores the current frozen displayed image in system image memory.

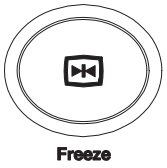
Maximum number of B-Mode images is 8.
Maximum number of Timeline images is 4.

All images are erased when the **New Patient** key is pressed or there is a loss of system power.

The Image Recall key displays a menu of the images stored in memory. After pressing **Image Recall**, select the desired image from the Soft Menu for display.

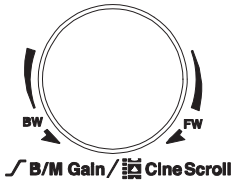
Mode, Display and Record (cont'd)

Record 1 and Record 2 are used to activate/print the designated recording device (i.e. video page printer, multi-image camera, image archive option).



The Freeze key is used to stop the acquisition of ultrasound data and freeze the image in system memory.

Pressing **Freeze** a second time continues live image data acquisition.



Controls the gain of the displayed echoes during B-Mode scanning. Controls the gain of the displayed timeline echoes during B/M- and M-Mode. During B/M-Mode, B-Mode gain can be controlled by the Doppler/CFM Angle Control.

The gain value displayed on the monitor is:

B-Mode	B-Mode Gain
M-Mode	M-Mode Gain
B/M-Mode	M-Mode Gain

When the image is frozen it controls scrolling forwards and backwards through the cine loop images in temporary memory.

Measurement and Annotation

This group of controls performs various functions related to making measurements, annotating and adjusting the image information.

Comment

The Comment key enables the image text editor and displays the annotation library soft menu. For more details, refer to *6–16*.

Body Pattern

The Body Pattern key enables the body pattern Soft Menu and displays the default pattern on the screen. For more details, refer to *6–27*.

M/D Cursor

The M/D Cursor key enables Trackball control of the M-Mode or Doppler cursor line (not angle correction) or the CFM window in real-time Color Flow Mode.

Scan Area

The Scan Area key enables Trackball control of the B-Mode image area size and position in B/W, the CFM window size and position in Color mode and the Zoomed area size and position in Zoom.

Measurement

The Measurement key is used in all types of basic measurements. It displays the measurement soft menu for the current exam category.

Measurement and Annotation (cont'd)

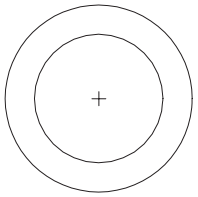
The Ellipse keys are used to activate the ellipse measurement function after the first distance measurement has been set. It also toggles which cursor is the movable cursor during the ellipse adjustment.

The Set key is used for various functions, but is generally used to fix or finish an operation (i.e. to fix a measurement cursor or exit scan area size/position in B-Mode and zoom).

The Clear key is generally used to erase or exit functions such as annotations/comments, measurements and zoom. This will return the system to the basic mode top menu.

Press the **Zoom** key to activate the zoom function. For more details, refer to *6–2*.

This knob is used to control the zoom size with the zoom function in real-time or rotate the probe position indicator in the body pattern function.



The Trackball is used with almost every key function in this group. Trackball control depends on the last key function pressed.

Beginning an Exam

Introduction

Begin an exam by entering new patient information.

The operator should enter as much information as possible, such as:

- Exam category
- Patient name
- Patient ID
- Comments
- Exam Information

The patient's name and ID number is retained with each patient's image and transferred with each image during archiving or hard copy printing.

Beginning a New Patient

The **New Patient** key should be pressed at the beginning of each patient study. Pressing this key automatically erases all patient data, annotations, measurements, calculations and summary report pages. A preset parameter can be set to prompt the user if they wish to erase all patient data or not. The system also resets every parameter (i.e. Zoom, 3D Mode, Triplex Mode, etc.).

NOTE: Oper ID and Ref MD will not be erased.

Enter patient data with the alphanumeric keyboard.

The **Soft Menu** automatically defaults to the last exam preset top menu when **New Patient** is pressed. An exam applications preset can be selected from the sub-menu to provide a suitable starting point for system scan parameters.

*NOTE: After a specific time interval the **Soft Menu** defaults to the "Mode" **Top Menu**.*

CAUTION

To avoid patient identification errors, always verify the identification with the patient. Make sure the correct patient identification appears on all screens and hard copy prints.

The Patient Entry Menu appears on the display monitor.

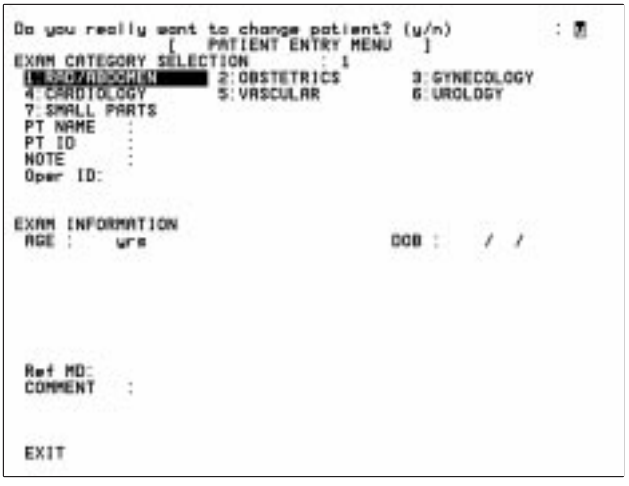


Figure 4–1. Patient Entry Menu

Beginning a New Patient (cont'd)

The first Data Entry field is presented in reversed display.

- **Trackball** to the exam category selection. Select from 7 examination categories: Radiology/Abdominal, Obstetrics, Gynecology, Cardiology, Vascular, Urology and Small Parts. Input the appropriate number. The patient information input menu changes. Information pertinent to the selected exam category appears in the menu.

To navigate through the Patient Entry Menu, use the **Return** key or the **Trackball** to move the cursor.

- Input the Patient Name (29 characters maximum).
- Input Patient ID Number (14 characters maximum).
- Input any desired Note (30 characters maximum).
- Input the desired Operator ID (four digits maximum).

NOTE: Patient Name, Patient ID, Notes, Oper ID, Ref MD, and Comments are common to all exam category menus.

The Patient Name and Patient ID will appear on the image screen. All other information is automatically entered into the appropriate exam report page.

Information in the Exam Category patient entry menus is considered necessary for that type of exam. Fill in all information possible.

- The display units of measure for items such as weight or height can be selected from the Set Up/Preset program menu page 10. Choose the priority and unit of measure on this Preset Menu page.
- Input Ref MD (16 characters maximum).
- Input comment field (2 lines of 50 characters each).
- When all patient data entries have been completed, highlight **Exit** and press **Return** or the **New Patient** key.

Beginning a New Patient (cont'd)

*NOTE: If patient information needs to be edited or the exam category changed, use the **ID Name** key. Pressing **ID Name** allows for modification of the Patient Entry Menus without erasing accumulated patient images, measurements, annotations, calculations and summary reports.*

NOTE: Patient age entry information (years, months, weeks, days) is selected in Set Up/Preset Program page 10, "Display Unit Age". Patient height is "Display Unit Height" and Patient weight is "Display Unit Weight". Choose the unit values that are to appear on the patient entry menu.

OB/GYN Exam Category

BBT is a pregnancy origin data selection choice that appears in the Tokyo University, Osaka University and European OB formats only. LMP, EDC and GA are the only choices in the USA version.

If the Multigestational option is installed, "Fetus Number:" will appear to the right of Ref. MD:. If there is more than one fetus, enter the correct number of fetuses. If the Multigestational option is not installed, each fetus must be scanned separately. Re-enter the patient's information for each fetus.

It is possible to read patient data from a PC (personal computer) into the LOGIQ™ 400 Patient Entry Menu. See the *Data Management Center (DMC) section of the Advanced Options chapter in the Advanced Reference Manual* for details.

ID/Name

The **ID/Name** key functions the same as the **New Patient** key except it does **NOT** erase previous patient data (i.e. measurements, calculations, etc.) Use the **ID/Name** key to enter or replace patient data without changing the current status of the system. One common reason might be to change the exam category.

Pressing **ID/Name** enables the Patient Entry Menu.

Edit the menu as described in *Beginning a New Patient*.

No other function can be started until ID/Name is completed. To complete the ID/Name process, press **ID/Name** a second time or move the highlighted cursor to **Exit** and press **Return**.

Helpful hints

Hints

If power is lost during the ID/Name function, any data that was added or modified will not be saved.

The following rules apply when filling in the New Patient menu:

- Press **Caps Lock** to type uppercase letters. Press **Caps Lock** again to type lowercase letters.
- Press **Back Space** to erase characters and correct errors.
- To change information, press **Return** or use the **Trackball** to move to the field, then type over the existing information with correct information.
- Press **Return** to move to the next field.
- Use the **Trackball** to move the reversed cursor to the desired item.
- When pressing **Return** at the last data entry field, the system returns to real-time scanning.
- Standard keyboard keys repeat when held down.
- To start over, press **New Patient.**

  Remember, user and factory-defined presets are dependent upon the exam category selected when filling in the New Patient menu.

Exam Application Preset Selection

Introduction

Select the exam category application preset, that best describes the desired study to be performed, from the factory default preset selections displayed on the Soft Menu.

A typical example for OB is shown in Figure 4–2.

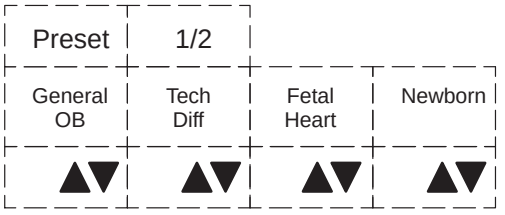


Figure 4–2. OB Preset Selection

Use these parameters as a starting point for the exam.

Selecting a probe

- Always start out with a probe that provides optimum focal depths and penetration for the patient size and application.
- Begin the scan session using the default Acoustic Output setting for the probe and application.

The “Change Probe and Category” preset, found on System Parameters page 1, allows the exam category to automatically change depending on the probe selected.

Some probes are used in more than one exam category. If the default for “Change Probe and Category” is set to *Simultaneous* and the wrong exam category is automatically activated, press **ID/Name** to select the correct exam category.

B-Mode

Introduction

The LOGIQ™ 400 offers a wide variety of display formats. Each format shows the operator valuable information relating to patient data and system scan parameters.

B-Mode, also referred to as 2-D Mode, displays a two dimensional gray scale image of the structures within the probe's field of view. The anatomy imaged can be evaluated, measurements and calculations performed as well as making an initial survey prior to entering other modes.

B-Mode Key Operation

Pressing the **B**-Mode key while in a combination of other modes will result in the following:

Current Mode	Resultant Mode
B/PD	B
B/M	B
B/CFM and PD	B/CFM
B/CFM and M/CFM	B/CFM
B/CFM	B
M/CFM	B/CFM

Table 5–1. B-Mode Key Operation

Reading the B-Mode Display

Figure 5–1 shows the basic B-Mode display information.

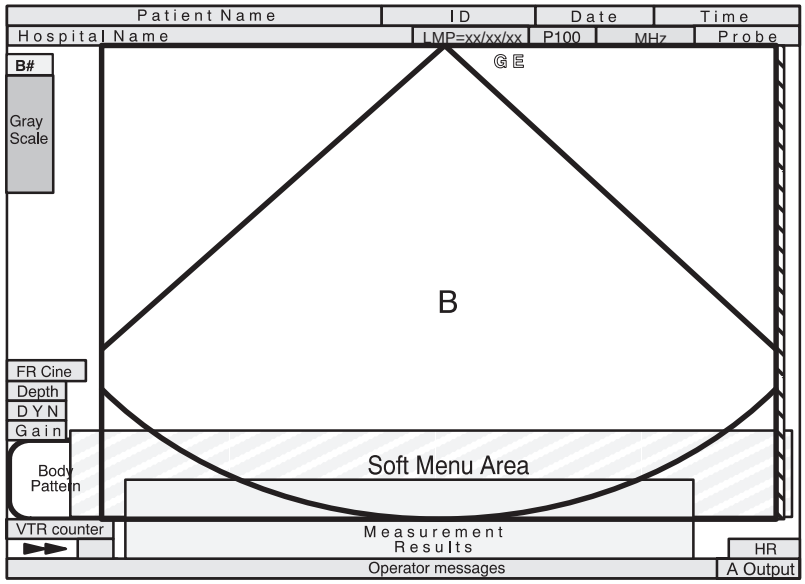


Figure 5–1. B-Mode Display Format

Reading the B-Mode Display (cont'd)

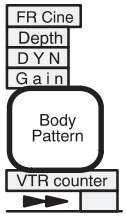
B-Mode Display	Description, Format, Values
Patient Name	A maximum of 29 alphanumeric characters. Input at Patient Entry Menu.
ID	Patient identification number. A maximum of 14 alphanumeric characters. Input at Patient Entry Menu.
Date	Today's date according to the system settings. Can be preset to display as MM/DD/YR, DD/MM/YR, or YR/MM/DD.
Time	Displays the current time during normal operation. Can be preset to a 12 or 24 hour clock. Displays the frame acquisition time when in Cine Mode.
Hospital Name	A maximum of 29 alphanumeric characters. Input at Set Up/System Parameters, page 1.
LMP or GA	In GYN Exam Category: LMP=xx/xx/xx In OB Exam Category: GA (xxx)=##W#D The xxx after the GA shows how gestational age was calculated: LMP, EDD or OPE (operator entered) – These are input in the Patient Entry Menu.
Acoustic Output Percentage	The percentage is preceeded by a "P" and then a number from 0–100.
Frequency of Operation (Imaging Freq)	Frequency of Operation (for B- and M-Modes). The image frequency value is displayed in MHz. The Frequency of Operation value coincides with the *"B Image Frequency"* and *"M Image Frequency"* presets located on Set Up/Custom Display pages 2 and 3, respectively. The image frequency can range between Normal, Resolution, Penetration, Further Penetration, Harmonic 1 and Harmonic 2. The table on *5–20* shows the correlation between the image frequency optimization setting and the frequency of operation value. When Harmonic is active, the letter "T" is shown before the frequency value.
Probe	Probe name or designation of the active probe.
Scan Orientation GE or ⊙	GE or the marker is used for scan orientation. This should coincide with the probe orientation marking on the probe body. This marker can be turned off in Set Up/ Custom Display page 10.

Table 5–2. B-Mode Display Explanation

Reading the B-Mode Display (cont'd)

Graphic Display	Description, Format, Values
B Gray Scale Map Number	The B gray scale map number is displayed above the gray scale bar on only B Mode. The B gray scale map number disappears when B-Color is active. When ATO map is active, an asterisk (*) is displayed on the right side of the gray scale map number.
Gray Scale Color Scale	Shows the B-Mode Gray Scale assignment. In Color Mode, the right half shows the Color Scale assignment.

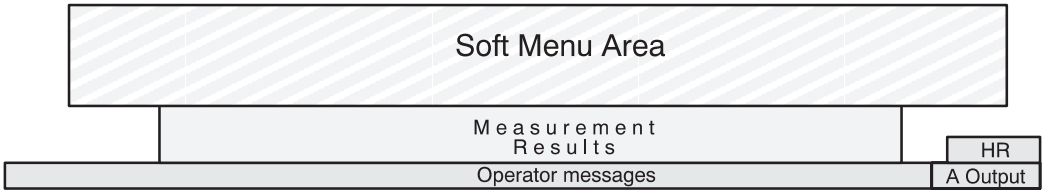
Table 5–3. B-Mode Display Explanation



Graphic Display	Description, Format, Values
FR/Cine	Shows display acquisition frame rate. ###Hz (Real-time) Can be turned off by a parameter in Set Up/Custom Display page 10. In Cine Mode it shows the display playback frame number. CN### (Frozen)
Depth	Shows the display in cm. ##cm Dual Mode: ##cm##
DR	Dynamic Range shows the range over which echo intensities are converted to gray scale. Displayed in dB. DR## Dual Mode: ##DR##
Gain	Displays the overall B-Mode or M-Mode Receive Gain. G## Dual Mode: ##G##
Body Pattern	Shows the pattern selected for scan orientation.
VCR Counter	Indicates the video tape location shown as: ##:##:##
▶▶	VCR status indication shows the current operational status of the VCR.
TV Counter	A two digit indication of the TV Frame count during VCR playback.

Table 5–4. B-Mode Display Explanation

Reading the B-Mode Display (cont'd)



Graphic Display	Description, Format, Values
Soft Menu Area	Displays the Top Menu and selected Sub Menus in this area.
Measurements	Lines of image measurement data are displayed in this area. The format and value depends on the type of measurement. The bottom line fills first and scrolls up as additional information is obtained.
Operator Messages	System generated messages are displayed on this line (i.e. error messages)
HR	Heart Rate is displayed here in beats per minute. ###BPM (Requires ECG input)
A Output	Acoustic Output display for MI (Mechanical Index) or TI (Thermal Index). The larger one is displayed. If both are less than 0.4, the message "TI=<0.4" is displayed.

Table 5–5. B-Mode Display Explanation

Acoustic Output Display

The acoustic output display in the lower right corner of the screen is intended to keep the user informed of the potential bioeffects that can result when controls are changed.

The Acoustic Output display shows MI (Mechanical Index) while in B-Mode. When other modes are selected TIS, TIB or TIC are displayed. See Figure 5–2 on *5–7*.

LOGIQ Display increments are 0.2 for values of one or less and 1.0 for values greater than one. Display accuracy for MI is –50% to +50%. Display accuracy for TI is –50% to +100%. For all index values, if the calculated value is less than 0.4, the display will be "<0.4".

Acoustic Output Display (cont'd)

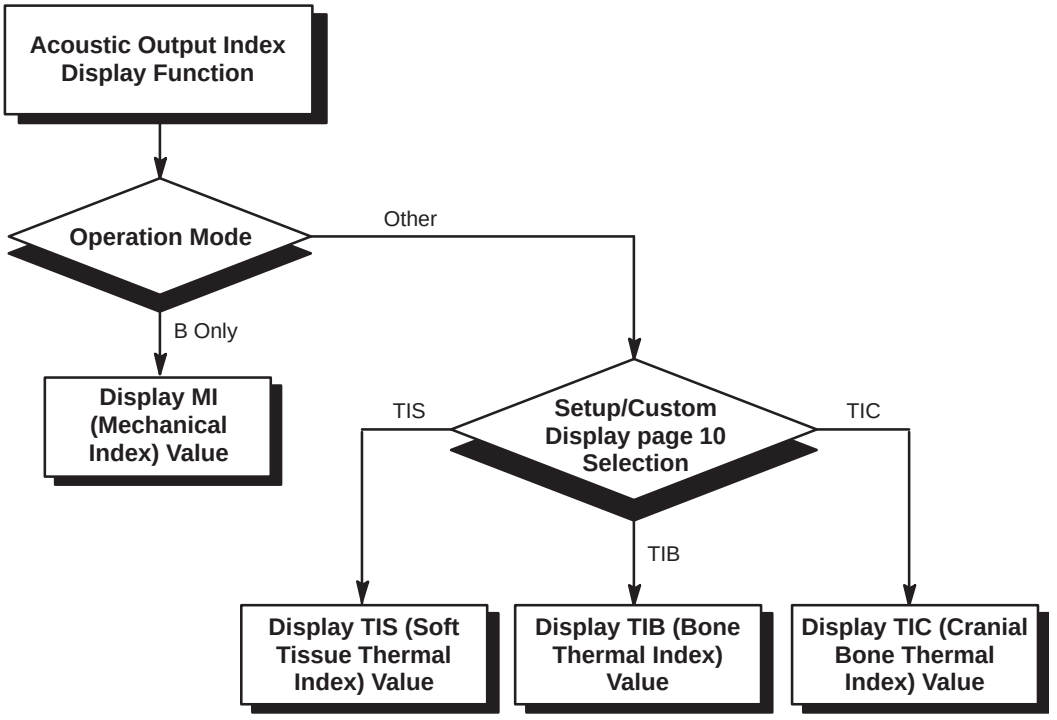


Figure 5–2. Acoustic Output Display Selection

Adjusting the Acoustic Output

The initial acoustic output may be preset within the range of 0% and 100% in Set Up/Custom Display page 1. Acoustic power settings are available for B/M and D/CFM/PDI with the following presets:

- Acoustic Power B/M [%]
- Acoustic Power D/CFM/PDI [%]

Reading the B-Mode Display (cont'd)

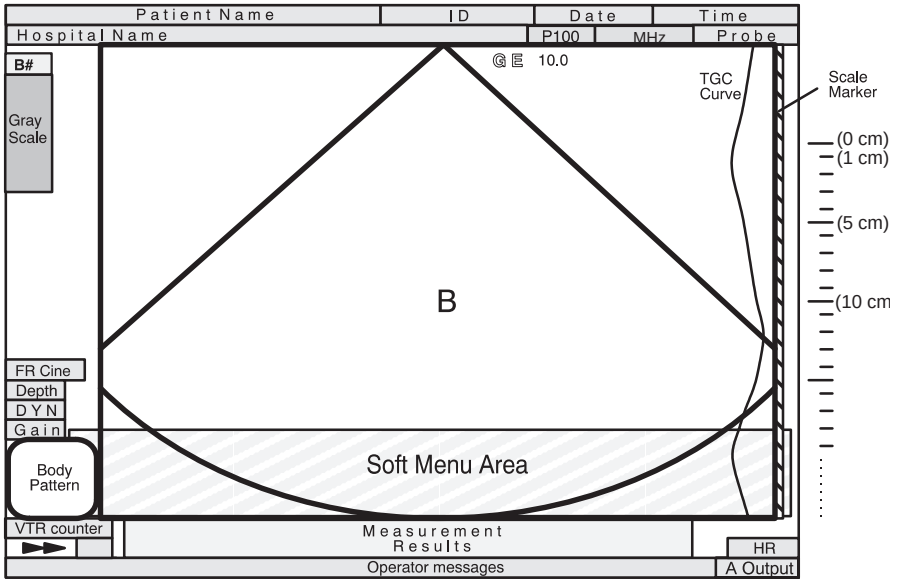
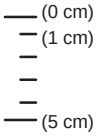


Figure 5–3. B-Mode Display Format

Scale Marker



Scale markers are presented along the right side of the display as large marks every 5cm and small marks every 1cm.

The TGC curve displays the relative position of the TGC slide pots compared to their depth.

This display can be turned on or off in the Setup/Custom Display Menu page 10.

10.0

The number displayed next to the probe orientation symbol is the zoom or scroll depth starting point for the image displayed.

Optimizing the Image

Control Layout

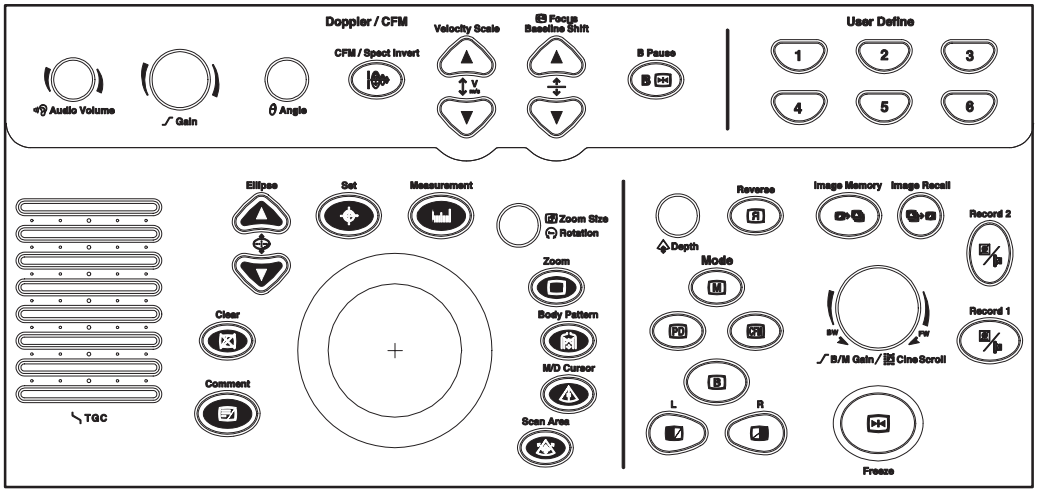


Figure 5–4. Controls

Mode and Display controls are on the lower right side, while Acoustic Output and TGC are on the lower left side.

Controls

	Acoustic Output (Audio Volume knob)	TGC
Description	The Audio Volume knob allows for varying the power output of the transmitted sound wave except in Doppler and CFM Modes. Follow the principle of "as low as reasonably achievable" (ALARA) when scanning patients. Always use the least amount of acoustic output possible to obtain an optimal image.	Amplifies returning signals to correct for the attenuation caused by tissue at increasing depths. The individual eight slide pots correspond to the maximum display depths for each probe.
Accessing/ Changing	*NOTE: Always optimize gain before increasing the acoustic output.* Clockwise rotation increases the acoustic output level. Counterclockwise rotation decreases the acoustic output level.	*NOTE: Active slide pots backlight.*
Benefits	Optimizes the image quality thereby minimizing exposure time to the patient while maximizing penetration and echo return.	Balances the image so that the density of echoes is the same throughout the image.
Values	The mid-range acoustic output setting is factory preset to be a reasonable setting for each type of exam category. Acoustic output levels are returned to the factory preset value when changing the following: • Probe • Exam category • New patient	When display depth is changed, TGC is rescaled to affect the new depth range. Each TGC pot is proportionally scaled across the display depth range as shown in Figure 5–5 on *5–11*.
Affects on Other Controls	Acoustic output and gain interact to affect acoustic output exposure. To a point, gain can be increased to compensate for a reduction in acoustic output. This minimizes acoustic output exposure.	In Zoom, the TGC adjusts automatically if the "TGC Depth Remap" preset, on Custom Display page 10, is set to ON. Only the TGC pots that affect the zoomed region of interest will be lighted.
Bioeffects **Acoustic Output Hazard**	Increasing acoustic output increases Mechanical and Thermal Index values; decreasing acoustic output decreases Mechanical and Thermal Index values. However, the improvement in image quality should allow the patient exposure time to be decreased. **CAUTION** Observe the effect of acoustic output adjustment on the TI/MI display. Increasing the index values to levels greater than 1.0 should take into account the risk/benefit potential.	

Controls (cont'd)

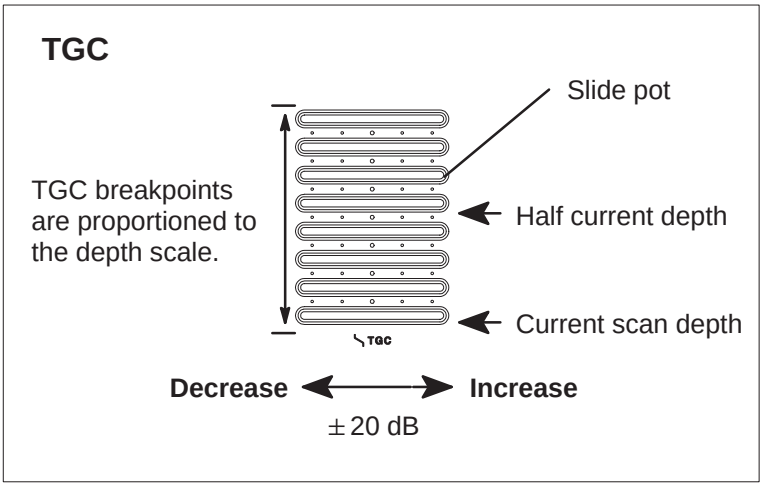


Figure 5–5. Time Gain Compensation

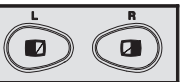
Controls (cont'd)

	Depth	**B/M Gain**
Description	Controls the distance over which the B-Mode images anatomy. Display depth may be changed according to the anatomical size or to the region of interest. Minimum/maximum values available depend on the probe. Select from 4, 5, 6, 7, 8, 10, 12, 14, 16, 18, 20, 22, and 24 cm for the desired depth.	Increases or decreases the amount of echo information displayed in an image. It has the effect of brightening or darkening all displayed echoes at any depth.
Accessing/ Changing	To reduce depth (look at a shallower image), turn the **Depth** rotary encoder clockwise. To increase depth (look at a deeper image), turn the **Depth** rotary encoder counterclockwise.	*NOTE: It is not possible to change the gain on a frozen image.* *Changing the gain while in another mode does not affect the B-Mode image gain.* The Angle knob controls B-Mode gain in B/M and CFM-B/M-Modes.
Benefits	Depth adjusts the field of view. Increase the field of view to look at larger or deeper structures; decrease the field of view to look at structures near the skin line.	Allows for the balance of echo contrast so that cystic structures appear echofree and reflecting tissue fills in.
Values	Depth increments vary by probe. Values may be preset for each probe. Depth displays on the monitor in centimeters.	Gain displays on the monitor in dB. Gain increments are available every 2 dB within the range of 0 to 98 dB, depending on the selected probe.
Affects on Other Controls	After adjusting the depth, it may be necessary to adjust the TGC, focus, frame rate and edge enhance. Changing depth while scanning clears Cine memory, but not Timeline Replay. A bar is displayed in the timeline at which point it is not possible to scroll past this change.	After adjusting acoustic output, there may be a need to adjust the gain. Generally speaking, if acoustic output increases, the gain may need to decrease; a decrease in acoustic output may require an increase in gain. Gain and TGC interact together. Gain changes overall echo amplification while TGC changes amplification at specific depths.
Bioeffects **Acoustic Output Hazard**	Increasing the depth tends to decrease the MI and TI because the frame rate slows down.	Gain has no affect on Acoustic Output. However, with increased Gain, the output level can usually be reduced to produce equivalent image quality.
 Hints	Make sure enough space is left below the anatomy of interest to demonstrate shadowing or enhancement.	

Controls (cont'd)

	Scan Area Size	**Scan Area Position**
Description	Widen or narrow the size of the sector to maximize the image's field of view for convex and sector probes. Adjusts color window for linear probes.	The reduced sector angle can be steered to get more information without moving the probe. Colored markers around the image act as guides while steering the reduced sector angle.
Accessing/ Changing	To narrow the angle: • Press **Scan Area**. • Move the **Trackball** toward the left. To widen the angle: • Press **Scan Area** (if not already activated). • Move the **Trackball** toward the right. *NOTE: Pressing **Scan Area** toggles between size and steering control.*	To assign trackball control to the scan area position mode and steer the angle: • Press **Scan Area** (adjust scan area size). • Press **Scan Area** again. • Move the **Trackball** to the right or left.
Benefits	Increase the sector width to see a wide anatomical structure, decrease the sector width to have a faster frame rate.	Allows the movement of a reduced sector angle laterally. Beneficial in GYN.
Values	Sector/Convex Probe: Range from 10° to full "B" width. Linear Probe: Range from 10mm to full "B" width.	Continuous steer within the full maximum probe width.
Affects on Other Controls	Increasing sector size decreases the frame rate; decreasing sector size increases the frame rate.	In scan area position mode, press **Scan Area** to return trackball control to the scan area sizing mode.
Bioeffects **Acoustic Output Hazard**	As the sector width narrows, the TI tends to increase since the target is being hit more often and the MI may decrease since the peak power is reduced. Observe the output display for possible effects.	

Controls (cont'd)

	Reverse	**Display Format (Dual)** 
Description	Controls the horizontal orientation of the image on the screen. It toggles the left/right orientations of the image display.	Each scan mode or combinations of modes can be displayed in dual format (side by side images). The **Left Image** and **Right Image** keys allow for the dual format to be displayed.
Accessing/ Changing	Press the **Reverse** key to toggle image reverse on or off.	To initiate the dual format display, press the **Left Image** key. The current display mode will be reduced to the left half of the image area. Press the **Right Image** key to activate the same image format on the right half of the image area. *NOTE: When the **Left Image** key and **Right Image** key are pressed simultaneously, while in single B-Mode imaging, the dual live image mode is activated.*
Benefits	The **Reverse** key allows for changing the orientation of the image display without physically rotating the probe 180°.	Allows for viewing two images side-by-side.
Values	On or Off. The GE logo at the top of the sector wedge corresponds to the orientation mark on the probe body. Pressing the **Reverse** key flips the image left/right and switches the GE logo to correspond to the probe mark.	System parameter displays relocated for each format.
Affects on Other Controls		Other controls only affect the active image.

Controls (cont'd)

	Focus Position
Description	While in B-Mode only, Focus Position can be adjusted using the Baseline Shift key.
Accessing/ Changing	Access the Focus Position control while in B-Mode only. To move the focal zone(s) up/down, press the **Focus (Baseline Shift)** up/down arrow key.
Benefits	Easy front panel key access. Avoids using soft menu Focus Position selection.
Values	Relative to depth of the display (FOV). Focal point indicators vary with position change up (shallow) or down (deep). Pre-processing function.
Affects on Other Controls	Changing the focus position affects frame rate. The deeper the focus, the slower the frame rate.
Bioeffects **Acoustic Output Hazard**	Moving the focal zone(s) may affect acoustic output requirements because of concentrating on a specific area of interest. Acoustic output may be decreased with the front panel control if the focal zone is properly placed. Observe the output display for possible effects.

B-Mode Sub-Menu Page 1

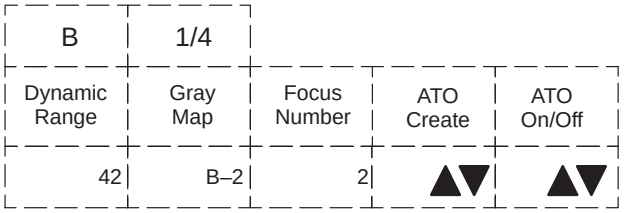


Figure 5–6. B-Mode Sub-Menu Page 1

	Dynamic Range	Gray Scale Mapping (Gray Map)
Description	Controls how echo intensities are converted to shades of gray.	Determines how the echo intensity levels received are presented as shades of gray.
Benefits	Useful for optimizing tissue texture to differentiate between echo levels that are close together. Dynamic range should be adjusted so that the highest amplitude edges appear as white while lowest levels (such as blood) are just visible.	Displays the received echo levels with different weights on specific levels of gray. For example, a certain gray map may enhance mid level echoes over a wider range of grays verses high or low level echoes. Allows for better differentiation between echo levels through gray levels displayed.
Values	The settings cycle in 6 dB steps from 30 dB to 90 dB. Use presets to set the output preferred to any scan mode and exam combination. The default for B Dynamic Range is set in the Set Up/Custom Display menu page 2. Dynamic range levels are returned to the preset value when changing the following: • Application • Exam category • New patient Pre-processing function.	There are 16 selections of Gray Scale Mapping. See Figure 14–6 on *14–16* for a graph of the Gray Scale Map. Post-processing function.
Affects on Other Controls	Operates only in real-time, not in freeze, Cine, Timeline replay, or VCR playback.	

B-Mode Sub-Menu Page 1 (cont'd)

	Focus Number	ATO Create (software option)
Description	Changes the number of focal zones so that the beam can be tightened or expanded for a specific area. A graphic caret corresponding to the focal zone position(s) appears on the right edge of the image.	ATO, Automatic Tissue Optimization, optimizes the image based upon a specified Region Of Interest (ROI) or anatomy within the display. ATO gray scale map is available only in B-Mode. The ATO option is not available on the LOGIQ™ 400CL. **ACCESSING/CHANGING:** Once ATO Create has been selected, a ROI box cursor is displayed on the image. Use the trackball for changing the size and location of the ROI box cursor. Press **Scan Area** to toggle between sizing and moving the cursor. Press **Set**. The system automatically optimizes the entire image. The highlighted sub-menu selection changes automatically from ATO Create to ATO ON/OFF.
Benefits	Optimizes the image by increasing the resolution for a specific area.	Improves productivity and patient throughput with one touch image optimization. Improves contrast of the displayed image data.
Values	Choose from 1, 2, 3 or 4 focal zones. Pre-processing function.	On or off.
Affects on Other Controls	Changing the focus number affects frame rate. The greater number of focus points, the slower the frame rate.	
Bioeffects **Acoustic Output Hazard**	Adding focal zones tends to increase TI, although it may decrease MI. Observe the output display for possible effects.	

B-Mode Sub-Menu Page 1 (cont'd)

	ATO On/Off (software option)
Description	The ATO On/Off selection is highlighted when the ATO map is active on the image. ATO ON/OFF can be toggled on and off to display that same ATO map again. When ATO map is active, the asterisk (*) is displayed on the right side of the gray scale map number. The B gray scale map number is displayed under the gray scale bar. The ATO option is not available on the LOGIQ™ 400CL. ATO gray scale map is available until changing the following: • Probe • New Patient • Exam Category • User Preset • Gray Scale Map • Power Off • New ATO map creation. Only one ATO gray map is available at a specific time.
Benefits	Ability to access the previously created ATO map without any time delay.
Values	On or off.

B-Mode Sub-Menu Page 2

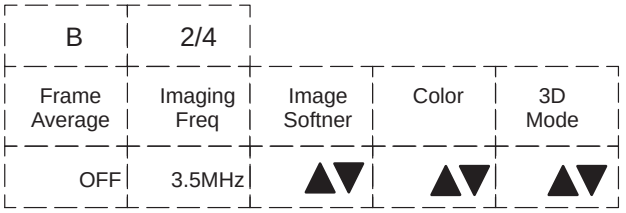


Figure 5–7. B-Mode Sub-Menu Page 2

	Frame Averaging	Imaging Frequency
Description	Averages previous frames of image data with the current frame. Frame averaging uses more data points to make up 1 image. This has the effect of presenting a smoother, softer image. *NOTE: Not available on Cine replay.*	In B-Mode, imaging frequency can be changed to allow more echoes to pass through.
Benefits	Helps to average out brief, sudden changes in echo intensity information. Could help to filter out low intensity noise.	Allows for an increase in echo intensity without changing gain, TGC or acoustic output with lower frequencies. Allows for increased resolution with higher frequencies.
Values	Frame average values are off, 1, 2, 3, 4, 5 and 6. Frame average values are returned to the preset value when changing the following: • Probe • Exam category • New Patient • Application type. Pre-processing function.	Values shown are probe dependent. Table 5–6 shows the correlation between the frequency values displayed and the imaging frequency mode preference (penetration, normal, resolution, further penetration, harmonic 1 and harmonic 2). To set the default image frequency for B-Mode and M-Mode, refer to Custom Display pages 2 and 3, respectively. Further penetration mode is available on the C358 probe only. Refer to *5–21* for details on Tissue Harmonics.
Affects on Other Controls		Acoustic output, gain and TGC may be able to be reduced due to increased penetration.

B-Mode Sub-Menu Page 2 (cont'd)

Probe	Frequency of Operation depends on Image Frequency Sub-Menu Selection					
	Resolution	Normal	Penetration	Further Penetration	Harmonic 1	Harmonic 2
B510	6.5MHz	5MHz	5MHz	N/A	N/A	N/A
S317	4MHz	3.5MHz	2.5MHz	N/A	T5.0	T4.7
S222	3.5MHz	3MHz	2MHz	N/A	T3.5	T3.2
3S	2.8MHz	2.4MHz	2.0MHz	N/A	T3.5	T3.2
S611	6MHz	5MHz	4MHz	N/A	N/A	N/A
S220 (W)	3MHz	2MHz	2MHz	N/A	N/A	N/A
E721(MTZ)	7MHz	6MHz	5.5MHz	N/A	N/A	N/A
C721	7MHz	6MHz	6MHz	N/A	N/A	N/A
C551 (CAE)	6MHz	5MHz	4.4MHz	N/A	N/A	N/A
C364 (CBF)	4MHz	3.5MHz	3MHz	N/A	N/A	N/A
C386	5MHz	3.8MHz	3MHz	N/A	N/A	N/A
C358	5MHz	4MHz	3MHz	2MHz	T5.0	T4.5
739L	9MHz	7MHz	6MHz	N/A	N/A	N/A
LA39	11MHz	9.6MHz	8.2MHz	N/A	N/A	N/A
546L	6.6MHz	5.2MHz	4.6MHz	N/A	N/A	N/A
LD	4MHz	3.5MHz	3MHz	N/A	N/A	N/A
L764 (LH)	7MHz	7MHz	7MHz	N/A	N/A	N/A
I739	8MHz	7MHz	6MHz	N/A	N/A	N/A
T739	8MHz	7MHz	6MHz	N/A	N/A	N/A
CWD2	N/A	N/A	N/A	N/A	N/A	N/A
CWD5	N/A	N/A	N/A	N/A	N/A	N/A
ERB7C	7MHz	6MHz	5.5MHz	N/A	N/A	N/A
ERB7L	7MHz	6MHz	5.5MHz	N/A	N/A	N/A

Table 5–6. Frequency of Operation

B-Mode Sub-Menu Page 2 (cont'd)

	Image Softener	Color
Description	B-Mode images may be adjusted for the amount of smoothing applied.	Color allows for enabling B-Mode image colorization.
Benefits	Provides a smoother homogenous image display.	Displaying the gray scale as shades of color may allow for improved differentiation between echo levels.
Values	On or Off. Pre-processing function.	On or Off. The B-Mode color presented is a selection in the Set Up/Custom Display menu page 11. There are 6 color choices. Post-processing function.

	3D Mode (option)
Description	Allows for 3D Mode option activation from the B-Mode menu.
Benefits	Allows for quick on/off of 3D Mode function from B-Mode Sub-Menu.
Values	On or Off.

THI (Tissue Harmonic Imaging) (option)

Description—Tissue Harmonic Imaging utilitizes the natural harmonic characteristic inherent in non-linear sound propagation properities in the human body. This function does not permit the use of any contrast agent. It is only available on the S222, S317, C358 and 3S probes. The THI option is not available on the LOGIQ™ 400CL.

Benefits—Harmonic imaging diminishes low frequency high amplitude noise and often improves imaging technically difficult patients. Tissue Harmonic imaging is beneficial to contrast resolution and cystic clearing.

Accessing/Changing—Access Tissue Harmonic frequency using the Imaging Freq sub-menu selection. See *5–19* for details. To easily recognize a tissue harmonic frequency, the letter "T" precedes the frequency value on the monitor and soft menu.

B-Mode Sub-Menu Page 3

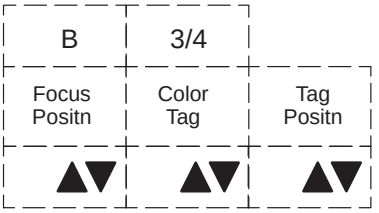


Figure 5–8. B-Mode Sub-Menu Page 3

	Focus Position	Color Tag
Description	Changes the depth at which the selected number of focal zones are optimized. All graphic carets representing focal points will move with a change in focal position.	Enables the colorization of a specific gray scale level range. This causes the specified gray levels to be displayed as a predetermined color in the B-Mode image.
Benefits	Optimizes the image by centering the focal point(s) to the depth of the area of interest.	Allows for the quick recognition of specific gray levels by colorization.
Values	Relative to depth of the display (FOV). Focal point indicators vary with position change up (shallow) or down (deep). Pre-processing function.	On or Off. The color tag size presented is a selection in the Set Up/Custom Display menu page 11. Post-processing function.
Affects on Other Controls	Changing the focus position affects frame rate. The deeper the focus, the slower the frame rate.	
Bioeffects **Acoustic Output Hazard**	Moving the focal zone(s) may affect acoustic output requirements because of concentrating on a specific area of interest. Acoustic output may be decreased with the front panel control if the focal zone is properly placed. Observe the output display for possible effects.	

	Tag Position
Description	Allows for the movement of the specified color tag range throughout the gray scale displayed.
Benefits	Allows for setting the color tag to the desired level of gray scale colorization.
Values	If the Color Tag selection is not enabled when Tag Positn is selected, Color Tag is automatically activated. Move the color tag up or down the gray scale. Color and size of the tag are determined in the Set Up/Custom Display menu page 11. Post-processing function.

B-Mode Sub-Menu Page 4

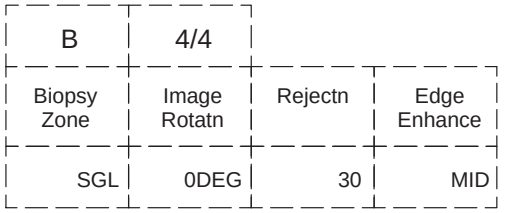


Figure 5–9. B-Mode Sub-Menu Page 4

	Biopsy Zone	Image Rotate
Description	This selection enables any electronic biopsy guidezone(s) available for the active probe. If the single fixed angle (SGL) was selected as the needle guide type in Set Up/Custom Display page 1, the fixed zone angle is displayed. If the needle guide type selected is multiple angle (MBX), the Biopsy Zone up/down arrow keys can be used to cycle through the angle selections MBX1, MBX2, MBX3 and OFF.	Rotates the single real-time or zoomed B-Mode image in 90° increments. When B-Mode is rotated 180°, the M-Mode (if active) is also rotated 180°.
Benefits	The electronic biopsy guidezone shows the expected needle path during insertion. **DANGER** Failure to match the guidezone displayed to the guide may cause the needle to track a path outside the zone. It is extremely important that when using the adjustable angle biopsy guides, the angle displayed on the screen matches the angle set on the guide, otherwise the needle will not follow the displayed guidezone which could result in repeated biopsies or patient injury.	Orient image display for easy reference.
Safety Concern	**DANGER** When the biopsy guidezone is displayed, the message: "Confirm BX type of Bracket" is displayed at the bottom of the screen with the angle selected. Ensure that the (M)BX type selected for each probe is the same as the angle selected on the biopsy guide. *NOTE: For specifics on availability of biopsy guide angles, see 15–33.*	

B-Mode Sub-Menu Page 4 (cont'd)

	Biopsy Lines	Image Rotate
Values	On (SGL, MBX1, MBX2, MBX3, TV0, TR5, 1~8, GBX) or Off. *NOTE: Press the **Measurement** key once to display the integrated biopsy depth cursor and center line while the guidezone is present. Use the **Trackball** to measure the needle length. Needle length is from the top of needle barrel to the target.* See Figure 15–12 on *15–32* for measuring the needle length.	The image rotates in 90° increments in a clockwise and counterclockwise direction. Post-processing function.
Affects on Other Controls		**CAUTION** When reading a rotated image, be careful to observe the probe orientation to avoid possible confusion over scan direction or right/left image reversal.

	Rejection (Rejectn)	B Edge Enhance
Description	Allows for the elimination of low level echoes from the display. This is generally used to clear noise out of vessels or cysts.	B edge enhance brings out subtle tissue differences and boundaries by enhancing the gray scale differences corresponding to the edges of structures.
Benefits	Allows for the elimination from the display image of low level echoes caused by noise.	Edge enhance modifies the B-Mode image by accentuating the interfaces between organs or vessels.
Values	Off and 2 through 40 in increments of 2. Post-processing function.	The four selections are Off, Low, Mid and High. The default for B Edge Enhance is set in the Set Up/Custom Display menu page 2. Edge enhance levels are returned to the preset value when changes are made to the following: • Application • Exam category • New patient Pre-processing function.
Affects on Other Controls	Rejection affects real-time imaging, frozen, Cine or VCR playback images.	Operates in real-time only, not in Freeze, Cine, or VCR playback.

B-Mode Optimization

B-Mode Optimization			
Adjustments for...	**Do the Following...**	**Adjustments for...**	**Do the Following...**
Image too grainy	1. Increase **Dynamic Range**. 2. Increase **Frame Average**. 3. Decrease **Edge Enhance**. 4. Change **Gray Map**.	Image too soft	1. Decrease **Dynamic Range**. 2. Increase **Edge Enhance**. 3. Decrease **Frame Average**. 4. Change **Gray Map**.
Image too noisy	1. Decrease **B/M GAIN**. 2. Decrease **Dynamic Range**. 3. Increase **Frame Average**. 4. Increase **Edge Enhance**.	Improve Uniformity	1. Increase the number of focal zones. 2. Decrease **SCAN AREA SIZE**. 3. Adjust **TGC** to compensate for attenuation.
Cystic Imaging	1. Decrease the **B/M GAIN**. 2. Decrease **Dynamic Range**. 3. Use **SCAN AREA SIZE** to reduce image width. 4. Change **Focus Number** to increase number of focal zones. 5. Optimize focal zone placement.	Technically Difficult Patients	1. Select the proper probe or change **Imaging Freq.** for the exam (larger patient, lower frequency). 2. Increase **ACOUSTIC OUTPUT**, if necessary. 3. Maintain a lower **Dynamic Range** (45 to 48). 4. Decrease **SCAN AREA SIZE** for faster frame rates.

B/W Option

Adding Color

Gray Scale Color

Each mode selection (except CFM) can display the shades of gray as shades of a color. The system simply maps out the gray levels as hues of a color scale.

The gray scale bar changes color and the image display changes accordingly.

The color displayed is selected in the Set Up/Custom Display menu. The preset “Color Map” is chosen separately for B-Mode, M-Mode and Doppler displays. Details on the color map selection are found in *Customizing Your System*.

Colorized gray scale is an on/off selection found in each mode Top Menu.

In each mode (B, M, PD and CWD), the color selection is found on the Sub-Menu page two.

The **Color** rocker switch toggles colorized gray scale on or off.

Color Flow Mode

Color Flow Mapping (CFM) may also be referred to as Color Doppler or Color Doppler Imaging. It is used to display color coded blood flow information super imposed on the B-Mode, M-Mode or Doppler displays.

Activating Color Flow

To activate Color Flow Mapping, press the **CFM** key (color flow). The key backlights while in Color Flow Mode. The color flow image appears after a short pause.

Color Flow Mapping can be used with B-Mode, M-Mode or Doppler Imaging.

In B-Mode, the Color Flow information overlays the B-Mode image.

The **Scan Area** key and **Trackball** now control the size and position of the color flow window.

M-Mode

In M-Mode, the color flow information overlays the B-Mode image. The color displayed in the M-Mode is that which is seen along the timeline cursor.

The Color Map selected for B-Mode applies to M-Mode. The size and position of the color flow window in B-Mode determines the color information displayed in M-Mode.

Exiting Color Flow

To exit Color, press **CFM** (color flow).

Reading the Color Flow Display

The following information displays on the Color Flow Mode image:

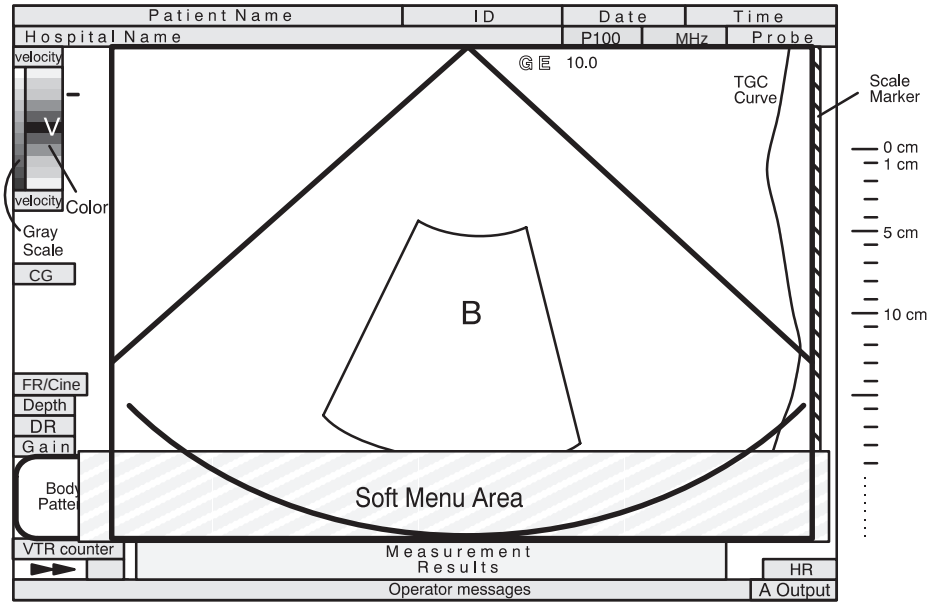


Figure 5–10. Color Flow Mode Graphic Display

Graphic Display	Description, Format, Values
Velocity Scale	Raises/lowers the velocity scale on the color bar. Displayed in cm/m per second or Hz.
Color Scale	Displays the selected velocity, velocity & variance, power, or velocity & power map.
CFM Area Cursor	Color displays only in this sector. Press the **Scan Area** key to toggle between cursor size and position control. Size this window using the **Trackball**. Position this window via the **Trackball**.
MTI Filter	Displays on the Color Flow bar as a black area surrounding the baseline.
Color Threshold Marker	The color display threshold based on the B-Mode gray scale level.
Units (V or F)	Indicates the unit of measure. Velocity (V) in meters per second or Frequency (F) in KHz.
Color Gain (CG)	Displays the Color Receive Gain value from 0 to 31. CG## Dual Mode: ##CG##

Figure 5–11. Color Flow Mode Display Format

Optimizing the Color Flow Image

Control Layout

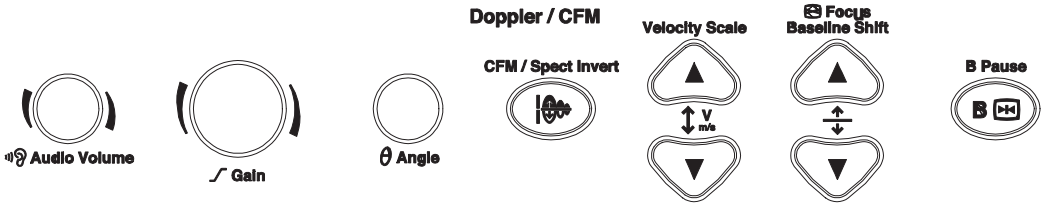


Figure 5–12. Color Doppler Controls

Color Flow Mapping is basically Doppler velocity/direction information mapped as a color on top of the gray scale B-Mode (or M-Mode) Image.

Keyboard controls used to affect the Doppler spectrum also affect CFM Mode. However, some Soft Menu controls affect only the color processing and display.

Common Controls

Description

After initial transmission/reception, CFM processing is generally separate from gray scale processing.

Acoustic output affects the transmit power for both B-Mode and Color Flow Mapping signals.

TGC, Depth, B/M Gain and Reverse function only on the B-Mode image displayed.

The **M/D Cursor** key is not relevant to CFM scanning; it only affects the Doppler/M-Mode.

Dual format keys (L–R) work the same as in dual B-Mode, but display two B-Mode and CFM images on the left and right side of the screen.

NOTE: If "L" and "R" keys are pressed simultaneously, both left and right B-Mode images will be active. Pressing CFM will then provide a live B-Mode image on the left and a live B-Mode with CFM on the right.

Controls

	Color Doppler Gain	CFM/Spectrum Invert
Description	Amplifies the overall strength of the echoes being processed in the Color Doppler section.	Allows for viewing blood flow from a different perspective, i.e., red away (negative velocities) and blue toward (positive velocities). Color reverses a real-time or frozen image. *NOTE: Invert reverses the forward/reverse color assignment.*
Accessing/ Changing	Gain values change depending on the probe; gain is not associated with a particular position of the knob. To increase gain, turn the **Gain** knob clockwise. To decrease gain, turn the **Gain** knob counterclockwise.	To reverse the color assignment, press **CFM/Spect Invert.**
Benefits	Allows control of the amount of color within a vessel.	Allows viewing of blood flow according to personal preference, or display proper color without changing probe orientation.
Values	The settings range is 32 levels, but values are not displayed on the image monitor. Usually set the dial in the middle, depending on the vessel.	Invert and non-invert.
Affects on Other Controls	The system automatically adjusts the gain based on acoustic output.	
Bioeffects	Color Doppler gain has no affect on acoustic output. However, with increased color Doppler gain, the output level can usually be reduced to produce an equivalent spectrum image quality.	When *"Spec. Inv. in Triplex"* preset on Custom Display page 14 is set to Simultaneous, the Doppler spectrum is also inverted.

Controls (cont'd)

	Velocity Scale	Color Flow Baseline Shift
Description	Increases or decreases the Velocity Scale represented by the color bar.	Minimizes aliasing by reallocating the forward/reverse color velocity scale assignment. For example, it allows a greater portion of the color scale to be assigned to forward flow than to reverse flow. Baseline Shift adjusts the point in the color spectrum where the color velocity is at zero (black).
Accessing/ Changing	To increase velocity scale, press the **Velocity Scale** up arrow key until reaching the desired scale. To decrease velocity scale, press the **Velocity Scale** down arrow key until reaching the desired scale.	To adjust the baseline shift, press the **Baseline Shift** up or down arrow keys. Baseline does not wrap. If the baseline is positioned at the top of the color bar, shifting the baseline again will cause the system to beep.
Benefits	If blood is flowing at a higher velocity, increase the velocity scale in order to avoid aliasing in the color display.	Minimize aliasing during color flow imaging.
Values	Velocity scale is displayed in cm per second.	Color flow baseline can be shifted to one of 7 proportionately-spaced positions on the color bar. Zero velocity follows the baseline. The total velocity range remains the same.
Affects on Other Controls	Velocity scale changes frame rate, acoustic output, and wall filter**.** When adjusting velocity scale, Cine memory is cleared.	
Bioeffects **Acoustic Output Hazard**	Changing the velocity scale tends to change the MI. Observe the output display for possible effects.	

Controls (cont'd)

	Color Flow Window Size (Scan Area)
Description	Color Flow data is placed on top of the gray scale image in a specific area. This is represented by a sector wedge outline with convex probes or a rectangle with linear probes. The size and position of this color area can be easily adjusted. The Color Flow window is a solid line when position may be adjusted by the Trackball. The Color Flow window is a dotted line when the size (CFM area) may be adjusted by the Trackball.
Accessing/ Changing	While in the CFM Mode, press **Scan Area** once. This assigns trackball control to color window size adjustment. Use the **Trackball** to adjust the color window size. • Move the **Trackball** left to close the color window and right to open it. • Move the **Trackball** down to increase and up to decrease the color window vertical size. Press **Scan Area** a second time to assign trackball control to positioning the re-sized window. *NOTE: Pressing **Scan Area** toggles between trackball control of window size or position.* Pressing **Set** fixes the color window size and position. Trackball control is returned to its previous assignment.
Values	Sector/Convex Probe. Ranges from 10° to full "B" width. Linear Probe. Ranges from 10mm to full "B" width.
Bioeffects **Acoustic Output Hazard**	Narrowing the image size may increase the frame rate, thereby increasing the TI. This change also tends to decrease the MI. Observe the output display for possible effects.

CFM Mode Sub-Menu Page 1

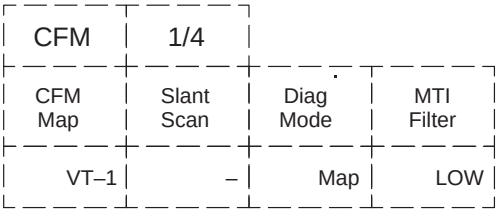


Figure 5–13. CFM Mode Sub-Menu Page 1

	Color Flow Maps	Slant Scan
Description	Allows for the selection of how Doppler velocities are mapped as color over the gray scale. The Color Bar represents the selected map.	Slant scan in CFM Imaging is used to control the position of the CFM window for **LINEAR PROBES ONLY**.
Values	The 6 color map selections available are assigned in the Set Up/Custom Display page 15. The parameters CFM Color Map 1–6 can be assigned as Velocity maps (V1 thru V8), Velocity/Turbulence maps (VT1 thru VT8), or Turbulence maps (T1 and T2) or Advanced Velocity Mode Maps (A1 thru A4). The Advanced Velocity Maps are only available with the ACE-2 option. The ACE-2 option is not available on the LOGIQ™ 400CL.	+ (left), 0 (center) and – (right). See Figure 5–14. Pre-processing function.
Benefits		Provides a color flow window suitable for linear probe operation.

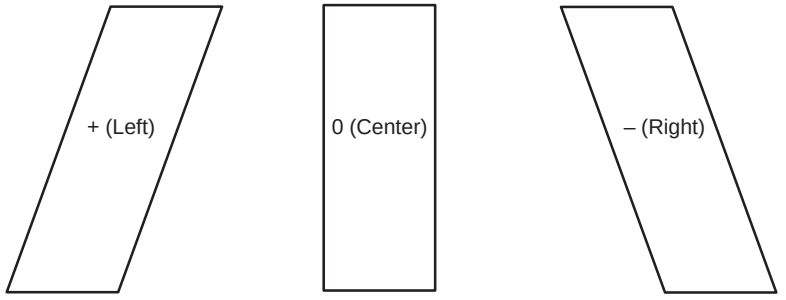


Figure 5–14. Slant Scan Window Selections

CFM Mode Sub-Menu Page 1 (cont'd)

	Diag Mode	Color Flow MTI Filter
Description	Allows for the selection of the best color flow display format. The 4 methods are: **Survey Mode (Svy)**—The Survey Mode is the default Diag Mode display and is common for each of the 2 programs. The Survey Mode displays the B/W B-Mode image and has an adjustable, full depth CF wedge that can be steered with the **Trackball**. **Survey/Detail Mode (SvyDtl)**—The Survey/Detail Mode displays a high resolution color flow window that is half the depth of the B-Mode image. The CF wedge is adjustable horizontally and vertically and can be steered within the full B-Mode image with the **Trackball**. **Map Mode (Map)**—In the Map Mode, the B-Mode image and the color flow are the same size. The Map Mode offers higher CF frame rates and a full size adjustable CF wedge. **Map/Detail Mode (MapDtl)**—The Detail Mode shows a high resolution, high frame rate color flow window that is half of the B-Mode depth. The B-Mode and the CF are the same adjustable angle.	Filters out low flow velocity color. This minimizes motion artifacts caused from breathing.
Benefits	Gives the operator a choice of CFM displays to optimize scanning.	Filters out the lowest velocities (colors).
Values	4 sequences are available in the Set Up/Custom Display menu page 15: • Survey>Map>Map/Detail • Survey>Survey/Detail • Survey>Survey/Detail>Map • Survey/Detail>Map/Detail Pre-processing function.	Values are Low, M1, M2, M3, M4 and High. Pre-processing function.
Affects on Other Controls	Display frame rate could be improved by minimized gray scale B-Mode image size or CFM window size.	

CFM Mode Sub-Menu Page 2

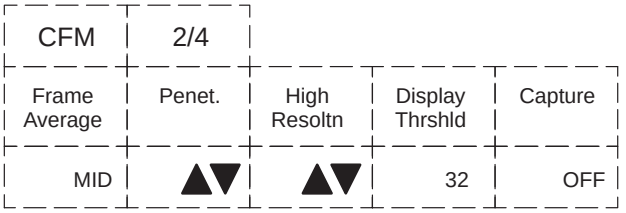


Figure 5–15. CFM Mode Sub-Menu Page 2

	Frame Average	Penetration (Penet.)
Description	Averages color information from previous frames with the current frame.	Penetration can be increased by lowering the operating frequency of the active probe. For reference, Color Flow Doppler frequencies (with penetration On or Off) are shown according to probe in Table 5–7 on *5–46*.
Benefits	Averages out one time events like noise spikes.	Allows for a slight increase in penetration without changing gain or acoustic output.
Values	Off, low, medium and high. Pre-processing function.	On or Off. Pre-processing function.
Affects on Other Controls	Trade off between frame rate and color quality. As the color quality increases, the frame rate decreases and as the frame rate increases, the color quality decreases.	Acoustic output, gain and TGC may be able to be reduced due to increased penetration.
Bioeffects		Decreasing the probe transmitting frequency, without decreasing acoustic output, tends to increase Mechanical and Thermal Index values. However, improved penetration should allow for decreasing patient exposure time.

CFM Mode Sub-Menu Page 2 (cont'd)

	High Resoltn (Resolution)	Color Flow Display Threshold
Description	Provides a quick way to maximize resolution for the CFM display.	Color flow display threshold is the gray scale level at which the overlay of color information stops. If the display threshold is set at a gray shade percentage of 34, any color information available will be overlaid below 34% of the gray scale map. Color information will not be placed on top of any part of the gray scale greater than 34% of maximum (white).
Benefits	Optimizes CFM color display by changing system parameters to maximize color line density.	Can limit color flow overlay to low level echoes inside vessel walls. Helps minimize color "bleeding" outside vessel walls.
Values	When High Resoltn is highlighted in the sub-menu display, the function is on. When it is not highlighted, it is off. Pre-processing function.	Post processing function. The color threshold can be set on real-time or frozen images. The settings cycle through the following values: 0% to 100% of the gray scale in 3% increments.
Affects on Other Controls	High Resolution will cause the scan frame rate to decrease.	

	Color Capture (option)
Description	Displays the highest mean velocity (average velocity) detected over a specific time interval. *NOTE: If a velocity map is selected, the image displays accumulated peak mean velocities. If a variance map is selected, the image displays variance for the accumulated peak mean velocities.*
Benefits	Useful in making slide presentations. Also refer to the *6–14* for post processing Cine Capture and Capture Frame functions.
Values	Off, 0.5 seconds, 1 second, 2 seconds and ECG. Pre-processing function.

CFM Mode Sub-Menu Page 3

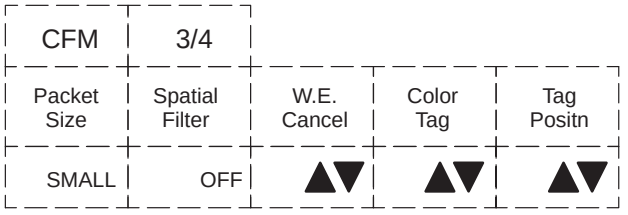


Figure 5–16. CFM Mode Sub-Menu Page 3

	Packet Size	Spatial Filter
Description	Controls the number of samples gathered for a single color flow vector.	Smooths color information so that it is less grainy. It averages the color information out over time.
Benefits	Allows for the improvement of the color sensitivity.	Smooths color information.
Values	Soft Menu values are VrySml, SMALL, MID and LARGE. "VrySml" is necessary for the ACE-2 option. The ACE-2 option is not available with the LOGIQ™ 400CL. *NOTE: The "CFM Packet Size" is a parameter that can be preset in the Set Up/Custom Display menu page 6.*	Off, 1, 2, 3, 4 and 5. *NOTE: The "CFM Spatial Filter" is a parameter that can be preset in the Set Up/Custom Display menu page 6.*
Affects on Other Controls	When the packet size is decreased, the frame rate is increased at the expense of CFM image quality. When the packet size is increased, CFM image quality is improved at the expense of frame rate. *Note: This function does not work in Color M-Mode or B/CFM with Pulsed Doppler.*	Affects frame rate. The slower the spatial filter averaging, the faster the frame rate; the higher the spatial filter averaging, the slower the frame rate.
Bioeffects **Acoustic Output Hazard**	Changing packet size may change the TI and/or MI. Observe the output display for possible effects.	Changing Spatial Average tends to decrease MI. Observe the output display for possible effects.

CFM Mode Sub-Menu Page 3 (cont'd)

	W. E. (Wall Echo) Cancel	Color Flow Velocity Tag (Color Tag)
Description	Eliminates the low velocity echoes caused by the motion of vessel walls.	Allows for the assignment of a single color to a range of velocities. Real-time or frozen images may be tagged. Velocity tags can be incorporated into velocity/variance color maps. *NOTE: The tag assignment appears on the color bar for reference.*
Benefits	Eliminate low velocity echoes caused by vessel wall motion to help clean up the color Doppler display.	Provides the ability to emphasize specific blood flow velocities so that they stand out to the eye.
Values	On or Off. Pre-processing function.	On/Off. Post-processing function. *NOTE: The "CFM Tag Width" is a parameter that can be preset in the Set Up/Custom Display menu page 15.*
Affects on Other Controls		

	Tag Position (Positn)
Description	Allows for the movement of the specified color tag range throughout the gray scale displayed.
Benefits	Allows for setting the color tag to the desired level of gray scale colorization.
Values	If the Color Tag selection is not enabled when Tag Positn is selected, Color Tag is automatically activated. Move the color tag up or down the gray scale. Color and size of the tag is determined in the Set Up/Custom Display menu page 15. Post-processing function.

CFM Mode Sub-Menu Page 4

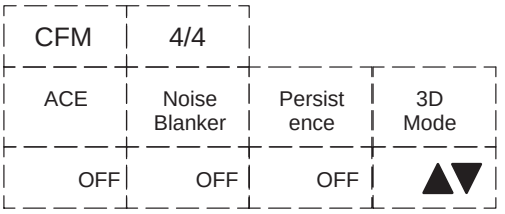


Figure 5–17. CFM Sub-Menu Page 4

An option is available to enhance CFM/PDI signal processing. It requires the necessary hardware (Color Processing Board) and software (CFM/PDI Enhancement). The following choices are added to the CFM Mode Soft-Menu:

- Adaptive Color Enhancement (ACE)
- Noise Blanker
- Persistence

	ACE (Adaptive Color Enhancement)	Noise Blanker
Description	Designed to reduce “color artifact noise”. This noise can appear as a flash of color synchronized with the heart beat while scanning the abdomen. The noise may also appear to fill the color window when changing window size/position or when moving the probe. Noise due to value motion in cardiac studies may be considered clutter noise.	Noise Blanker is intended to reduce the random noise generated due to the increase in Color Gain.
Benefits	Reduces the “color artifact noise” as described in the description section.	Noise Rejection increases color sensitivity with the ability to use higher color gains. Very effective when observing low velocity blood flow.
Values	On or Off.	OFF No Noise Blanking LOW Minimum Noise Blanking MID Medium Noise Blanking HIGH Maximum Noise Blanking
Affects on Other Controls	May have a tendency to reduce frame rate due to increased CFM processor functions.	Allows use of increased Color Gain or equivalent results with less gain.

CFM Mode Sub-Menu Page 4 (cont'd)

	Persistence	3D Mode
Description	Retains the largest pixel color value until a larger value is detected or preset time has elapsed. When a higher color value for a pixel is detected, that value is retained and the persistence time is reset for that pixel. When the persistence time elapses for that pixel, color is deleted and it returns to gray scale.	Allows for 3D Mode activation from the Color Flow menu.
Benefits	Present a continuous, high sensitivity color image.	Allows for quick on/off of 3D Mode function from CFM Sub-Menu.
Values	OFF No Persistence SHORT Short Persistence time MID Medium Persistence time HIGH Long Persistence time	On and Off.
Affects on Other Controls	The activation of the Persistence function will over ride any previous selections made for CFM Capture or CFM B Frame Average. When Persistence is deactivated CFM Capture and CFM B Frame Average will return to normal operation.	

CFM Optimization

Color Flow Mode Optimization			
Adjustments for...	**Do the Following...**	**Adjustments for...**	**Do the Following...**
Decrease Motion Artifact	1. Increase the **VELOCITY SCALE**. 2. Increase **W.E. Cancel**.	Eliminate Aliasing	1. Increase **VELOCITY SCALE**. 2. Lower **BASELINE SHIFT**.
Improve Sensitivity	1. Increase **GAIN**. 2. Decrease **VELOCITY SCALE**. 3. Increase **ACOUSTIC OUTPUT**. 4. Switch **Penet.** on and **High Resoltn** on. 5. Decrease **W.E. Cancel**. 6. Increase **Frame Average** (this allows gain to increase). 7. Increase **Packet Size**. 8. Reduce **SCAN AREA SIZE** to smallest size reasonable. 9. Optimize focal zone position.	Improve Frame Rate/Flow Dynamics	1. Decrease color window using **SCAN AREA SIZE** width. 2. Exit **COLOR FLOW** to reduce B-Mode image width (use **SCAN AREA SIZE**). 3. Decrease **DEPTH**. 4. Increase **VELOCITY SCALE** (if flow state allows it). 5. Decrease **Frame Average**.
Decrease Color Flow Bleeding	1. Decrease **GAIN**. 2. Increase **VELOCITY SCALE**. 3. Decrease **Display Thrshld**.		

Power Doppler Imaging (option)

	Power Doppler Imaging (option)
Description	Power Doppler Imaging, also known as PDI, (option) is a color flow mapping technique used to map the strength of the Doppler signal rather than the frequency shift or velocity of the signal. PDI is a different way of processing the power information from the color flow transmissions by using different color maps and not displaying directional information. Using this technique, the system plots color based on the number of reflectors that are moving, regardless of velocity.
Accessing/ Changing	While scanning in the CFM Mode, enable the Blue Shift key (key will be lighted) and press P. *NOTE: For USA systems, the User Define Key 6 has been locked and programmed to toggle the PDI mode on/off. User Define Key 6 can be reprogrammed for other functions if it is unlocked.* Although remaining in the CFM Mode Top Menu, the system will shift to the PDI presets and color maps.
Values	Only power maps are available in the PDI mode. P1 thru P4 are PDI maps. P5 and P6 are Directional PDI Maps (ACE-2 option). ACE-2 option is not available for the LOGIQ™ 400CL. Changes between non-topo and topo maps can only be done in real-time, not on a frozen image.
Affects on Other Controls	Only changes between P1 thru P4, P5 and P6 are post-processing functions and do not affect image acquisition controls. PDI parameters need to be changed in real-time. Some controls that affect CFM also affect PDI.
Optimizing the PDI Option **Hints**	Custom Display pages 8 and 16 have parameters specific to PDI. The PDI Velocity choice is a trade-off between low flow detectability and wall motion. The PDI B High Resolution choice is a trade-off between frame rate and color resolution. The PDI B Frame Average choice is a trade-off between a sharper noisy appearance or a smoother less noisy appearance to the image. The activation of the Persistence function will override any previous selections made for PDI B Frame Average. When Persistence is deactivated PDI B Frame Average will return to normal operation. The PDI B Wall Filter choice is made depending on the frequency of the probe. The PDI Map Transparency allows for the B-Mode image to be shown through the color flow display. This preset is found on Set Up/Custom Display page 7. *NOTE: Remember that parameters found on Custom Display page 8 are probe dependent. Set up these parameters for all probes that will be used for PDI.* *NOTE: Parameters on Custom Display page 16 are effective for all probes.*

B/W Option

Doppler

Introduction

Time zero (the start of the trace) appears on the left side of the graph. As time progresses, the trace moves to the right. The baseline of the graph (representing zero velocity, zero frequency shift or no detected flow) appears as a solid line running horizontally across the display. By convention, movement toward the probe is positive frequencies or velocities which appear above the baseline. Movement away from the probe is negative frequencies or velocities which appear below the baseline.

Typically, blood flow is not uniform but is composed of a mix of blood cells moving at different velocities and in different directions. Thus, the display is composed of a spectrum of gray scale values. Strong signals are displayed as bright shades of gray while weak signals are displayed as darker shades.

Information about the Doppler display is automatically written on the screen and updated when scanning parameters are changed.

The following can be used:

- Pulsed Wave (PW) Doppler
- Continuous Wave (CW) Doppler
- CW Non-Imaging Doppler

Pulsed Wave Doppler

PW Doppler is typically used for displaying the speed, direction, and spectral content of blood flow at selected anatomical sites.

PW Doppler can be combined with B-Mode for rapidly selecting the anatomical site for PW Doppler examinations. This is described under B/M-Mode operation. The site where PW Doppler data is derived appears graphically on the B-Mode image (Sample Volume Gate). The site can be moved anywhere within the B-Mode image.

Frequencies Used

For reference, Doppler frequencies (with penetration On or Off) are shown according to probe in the table below.

PROBE	FREQUENCY (MHz)	
	ON	OFF
B510	4.0	5.0
C358	2.5	3.3
C364/CBF	2.5	3.3
C386	2.5	3.3
C551/CAE	4.0	5.0
C721	5.0	6.6
E721/MTZ	5.0	6.6
ERB7	5.0	6.6
I739	5.0	6.6
546L	4.0	5.0
739L	5.0	6.6
LA39	5.0	6.6
LD	2.5	3.3
L764/LH	5.0	6.6
P509 *	4.0	5.0
S316/UC *	2.5	2.8
S317 *	2.5	2.8
S220/W *	2.2	2.5
S222 *	2.0	2.5
S611 *	4.0	5.0
3S *	2.0	2.2
T739	5.0	6.6

Table 5–7. Doppler/CFM Frequency

* Sector probes not available with LOGIQ™ 400CL.

Continuous Wave Doppler

Allows examination of blood flow data all along the Doppler Mode cursor rather than from any specific depth. Gather samples along the entire Doppler beam for rapid scanning of heart. Range gated CW allows information to be gathered at higher velocity.

NOTE: If split crystal is activated, CW is automatically selected.

There are two CW Doppler operating modes: Steerable and Non-Imaging.

Steerable—Allows viewing of the B-Mode image to position the Doppler cursor to the area of interest while viewing the Doppler spectrum (shown below the B-Mode image) and listening to the Doppler audio signal.

Works with sector probes only.

Non-Imaging—Provides only Doppler Spectrum and Audio for ascending/descending aortic arch, other hard-to-get-to spaces or higher velocities.

Requires a single CWD probe and connection.

Works with CWD probes only (CWD2, CWD5).

Reading the Doppler Display

NOTE: Timeline formats (M-Mode and Doppler) available for display are enabled on the Set Up/Custom Display screen menus.

First, choose the Side/Side or Top/Bottom display style on Custom Display page 12, "Timeline Format". The two styles cannot be mixed.

Second, choose the default settings for the Doppler format selections on Custom Display page 13.

The following information displays on the Doppler Mode image:

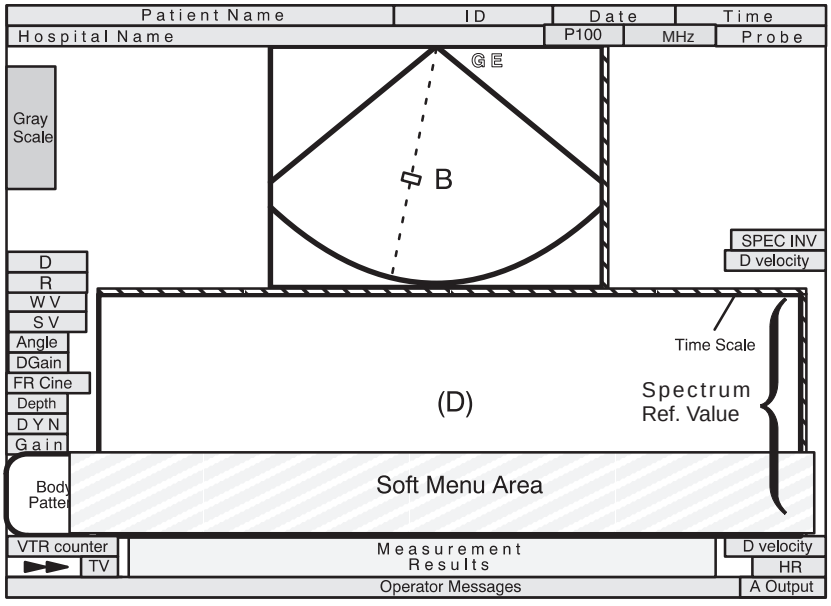
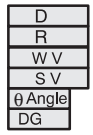
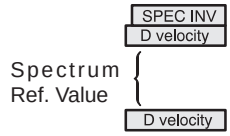


Figure 5–18. 1/2 B-Mode plus 1/2 D-Mode Display

Reading the Doppler Display (cont'd)

The following additional parameters are displayed when in Doppler Mode.





Graphic Display	Description, Format, Values
Doppler Frequency (D)	The value is displayed in MHz (MegaHertz).
Pulse Repetition Frequency (R)	Displays the frequency in KHz (KiloHertz).
Wall Filter (WV) (WF)	The velocity value is displayed in m/sec (meters per second) or the frequency value in Hz. WV### Dual Mode: ###WV###
Sample Volume (Length) (SV)	Displayed in mm. SV## Dual Mode: ##SV##
θ (Angle)	Indicates the Doppler Angle in Θ (degrees) between the Doppler Mode cursor and angle correction indicator. θ## Dual Mode: ##θ##
D.G	Doppler signal gain is displayed as a two digit number.
SPEC INV	Displayed to indicate that the spectrum display is inverted from the prescribed norm.
D. Velocity	The Doppler velocity or frequency maximum value is displayed in meters per second when *"Display Spectrm Ref. Value"* preset, found on Set Up/Custom Display page 14, is set to "Off". The forward velocity (frequency) is displayed above the spectrum while the reverse velocity (frequency) is displayed below. When the spectrum is inverted, the velocity scale readings also invert.
Time Scale	Three speeds: Slow (4 second sweep). Major marker = 1 second; minor marker = 0.5 second. Medium (2 second sweep). Major marker = 1 second; minor marker = 0.5 second. Fast (1 second sweep). Major marker = 1 second; minor marker = 0.5 second.
Spectrum Ref. Value	Doppler velocity or frequency value is displayed as a reference scale when *"Display Spectrm Ref. Value"* preset, found on Set Up/Custom Display page 14, is set to "On". The scale size varies depending on velocity or frequency.

Table 5–8. Doppler Mode Display Format

Activating Doppler Mode

Activating PW Doppler Mode

To activate PW Doppler Mode, press the **PD** key. The key backlights while in PW Doppler Mode. The Doppler sample line and cursor are displayed.

Press **PD** a second time and the Doppler spectrum displays along with the B-Mode image.

NOTE: Doppler display formats available depend on the presettable parameters found in the Set Up/Custom Display menus.

Position and size the sample volume to get a spectrum display. Use the system's audio to listen for when the sample volume is positioned over an area of flow.

To exit PW Doppler Mode, press **B**-Mode.

*NOTE: The Set Up/Preset Program allows the types of B/Doppler display formats to be chosen. Each time the **PD** (or **CWD**) key is pressed, it cycles to the next display format enabled in the Set Up/Preset Program.*

Activating CW Doppler Mode

To activate CW Doppler Mode, select **CWD** from the soft-menu.

The Doppler spectrum displays along with the B-Mode image (Steerable CW Doppler, **NOT** Non-Imaging CW Doppler).

To exit CW Doppler Mode, press **B**-Mode.

Doppler Optimization

NOTE: This section discusses the Pulsed Doppler controls and menu selections. If Continuous Wave Doppler is being used the keyboard controls are the same. Selections found in the CWD soft menu function the same as a like selection in the PWD soft menu.

Controls

Doppler Mode controls discussed in this section are shown below:

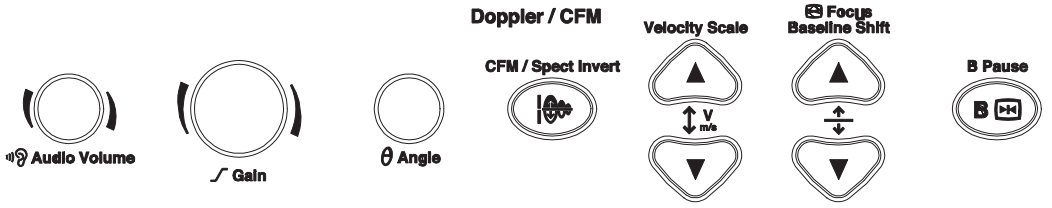


Figure 5–19. Doppler/CFM Controls

These functions are specific to pulsed or continuous wave Doppler when that mode is active, as well as color flow.

B-Mode Controls

Description

Several Front Panel controls affect the B-Mode portion of the display and not the echoes in the Doppler spectrum.

These are:

- TGC
- Depth
- B/M Gain
- Scan Area Size
- Scan Area Position
- Reverse
- Dual Format Keys (L/R)

NOTE: If the scan area size is reduced and the position changed, the Doppler cursor will follow the position change to stay within the displayed scan area.

See the *B-Mode* section of this chapter for details on B-Mode controls.

Controls

	M/D Cursor	Audio Volume
Description	Assigns trackball control to the B-Mode Doppler cursor. It also displays and erases the theta angle correction cursor.	Controls Doppler audio output. *NOTE: The system automatically unwraps aliased audio.*
Accessing/ Changing	Pressing **PD** will automatically assign trackball control to the B-Mode Doppler cursor. To terminate trackball control of the M/D cursor, press **SET**. To reactivate trackball control of the Doppler cursor, press **M/D Cursor**. *NOTE: Pressing the **M/D Cursor** key while the trackball is actively controlling the B-Mode Doppler cursor will display the theta angle correction cursor. (Refer to Theta Angle Correction on 5–54 for more information.)*	Pressing **PD** automatically activates Doppler Audio. The volume is initially set to the Audio Volume % chosen in the Set Up/Custom Display page 14. **CAUTION** Doppler audio sounds change rapidly, often abruptly. Increase the volume in small steps to avoid startling the patient.
Benefits	Allows for repositioning of the Doppler cursors after the trackball has been assigned a different function.	An audio representation of the flow within a vessel can be used before activating the spectral trace or CWD.
Values	On or Off. The Doppler cursor displays in the center of the screen or changes to the active color if already present.	The volume increases/decreases logarithmically, with positive flow through the right channel and negative flow through the left channel.
Affects on Other Controls	Terminates trackball control from its current function and assigns it to the Doppler cursor. When angle correction is active, the M/D cursor returns angle correction to zero degrees.	While in B-, M- and B/M-Modes, the Audio Volume knob adjusts Acoustic Output.

Controls (cont'd)

	Doppler Spectral Gain	Theta Angle Correction
Description	Amplifies the overall strength of the echoes being processed in the Doppler spectral trace.	Estimates the flow velocity in a direction at an angle to the Doppler vector by computing the angle between the Doppler vector and the flow to be measured. Estimated flow velocity equals the velocity toward the probe divided by the COSθ.
Accessing/ Changing	Gain (DG#) values are shown on the left side of the display. The initial gain value is selected in the Set Up/Custom Display menu page 4.	Flow towards the probe is mapped above the baseline of the spectral display and left speaker. To adjust the angle clockwise relative to the probe face, turn θ **Angle** clockwise. To adjust the angle counterclockwise relative to the probe face, turn θ **Angle** counterclockwise. Press **M/D Cursor** to quickly return the angle correction to zero degrees and erase the angle correction cursor from the display. The initial angle value is selected in the Set Up/ Custom Display menu page 4.
Benefits	Fills in or cleans out spectrum information.	Optimizes the accuracy of the flow velocity. This is especially useful in vascular studies where it is necessary to measure velocity.
Values	0 to 32 in increments of 2. Usually set in the middle of the range.	For optimum velocity measurements, the angle of incidence should be less than 20° for cardiac applications. The usual setting is between 45° and 65° for vascular applications. 1° increments from 0° to 80°.
Bioeffects	Doppler spectral gain has no affect on acoustic output. However, with increased Doppler spectral gain, the output level can usually be reduced to produce an equivalent spectrum image quality.	

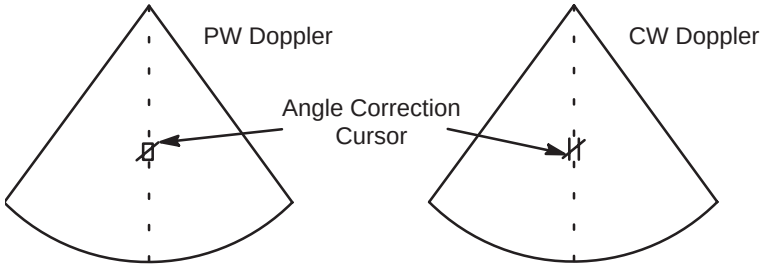


Figure 5–20. Phased Array Doppler Display with Angle Correct

Controls (cont'd)

	CFM/Spectrum Invert	Baseline Shift
Description	Vertically inverts the spectrum trace without affecting the baseline position.	Changes the spectrum baseline to accommodate higher velocity blood flow. Minimizes aliasing by displaying a greater range of forward flow than reverse flow. With baseline shift, higher velocities in one direction can be displayed without clipping off the peaks.
Accessing/ Changing	Forward flow (F) and Reverse flow (R) signs appear on the velocity scale which reverse when the spectrum is inverted. Positive velocities go to the bottom of the spectrum and to the right speaker. A spectral invert graphic appears on the display to indicate that the spectrum has been inverted. *NOTE: Inverting the spectrum does not affect the baseline position.*	Baseline shift adjusts the point in the spectrum where the velocity trace is at zero. The default baseline can be chosen in the Set Up/Custom Display menu page 15. The baseline is displayed as a solid line running across the spectrum. The baseline is raised and lowered in equal increments, depending on the current Doppler scale factor. The control does not wrap when the maximum baseline shift (in either direction) has been reached. This is a non-repeating key.
Benefits	If the blood flow is still moving in the same direction after changing the probe angle, the Doppler information may be reversed. It is easy to invert the spectrum instead of reversing the probe orientation.	Unwraps the alias. Rearranges the velocity scale display without changing the velocity scale. Readjusts the positive and negative velocities limit without changing the total velocity range.
Values		–75%, –50%, –25%, 0, +25%, +50%, and +75%, with zero being the center of the display, +100% being the top edge of the display and –100% being the bottom edge of the display.
Affects on Other Controls	The polarity of the audio Doppler is also reversed. When *"Spec. Inv. in Triplex"* preset on Custom Display page 14 is set to Simultaneous, the CFM spectrum is also inverted.	

Controls (cont'd)

	B Pause	Velocity Scale
Description	Freezes the B-Mode image while keeping the Doppler spectrum display active.	Adjusts the velocity scale to accommodate faster/slower blood flow velocities. Adjust the size of the presentation to show a low velocity scale for low flow and a higher velocity scale for high flow. The display updates velocity scale parameters after adjusting the velocity scale**.**
Accessing/ Changing	To pause the B-Mode image, press **B Pause.** To cancel B-Mode image freezing, press **B Pause**.	*NOTE: A bar is inserted in the display with each velocity scale change that cannot be measured across velocity scale changes.*
Benefits	The spectrum tracks the Doppler Sample Volume Gate in real-time.	Blood flow information is not cut off due to the effect of aliasing.
Values		Velocity range is in meters per second or KHz, depending upon preset velocity scale units. Velocity range is dependent on the probe frequency.
Affects on Other Controls	B-Mode pause increases the Doppler display quality. *NOTE: When pressing **Freeze** while in B Pause and then unfreezing the image, a preset selection will determine if the B Pause key is released or the image remains in B Pause. This is determined by the Set Up/Custom Display menu page 12 "Auto B Melt at Unfreeze".* *The echo level measurement is not available in B Pause. It is only available on a frozen image.*	When raising the velocity scale, the spectrum waveform decreases in size; when lowering the velocity scale, the spectrum waveform increases in size. Changes in the spectrum are relative to changes in the velocity scale, that is, it sizes accordingly. When adjusting the velocity scale, Cine memory is cleared. Velocity scale units change with sample volume size**,** depth, frame rate and Doppler wall filter. *NOTE: The velocity scale changes when angle correct is changed.*
Bioeffects **Acoustic Output Hazard**		Adjusting this control may cause minor changes in acoustic output. Observe the output display for possible effects.

PW Doppler Mode Sub-Menu Page 1

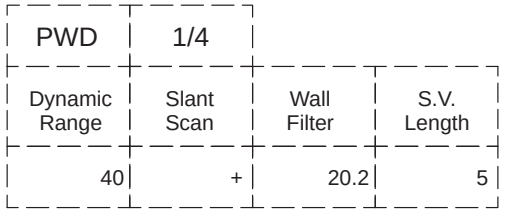


Figure 5–21. PW Doppler Mode Sub-Menu Page 1

	Dynamic Range	Slant Scan
Description	Controls how echo intensities are converted to shades of gray, thereby creating a range of gray scale that can be adjusted. (Also found in the CWD soft menu.)	Slant Scan in Doppler imaging is used to control the position of the Doppler cursor for **LINEAR PROBES ONLY**. (Also found in the CWD soft menu.) When Slant Scan is selected while in a B-Mode display, the B-Mode is not effected. Only the Doppler cursor will show at a slant. The Doppler angle remains constant in relation to the anatomy when slant scan direction is changed.
Benefits	Useful for optimizing tissue texture to differentiate between echo levels that are close together. Dynamic range should be adjusted so that the highest amplitude edges appear as white while lowest levels (such as blood) are just visible.	Provides a Doppler cursor suitable for linear probe operation.
Values	The settings cycle in 6 dB steps from 18 dB to 48 dB. Set the default value for PWD dynamic range in the Set Up/Custom Display menu page 4. Dynamic range levels are returned to the preset value when changing the following: • Application • Exam category • New patient. Pre-processing function.	+ (Left), 0 (Center) and – (Right). See Figure 5–22 and Figure 5–23. Pre-processing function.
Affects on Other Controls	Operates only in real-time, not in freeze, Cine, Timeline replay, or VCR playback.	

PW Doppler Mode Sub-Menu Page 1 (cont'd)

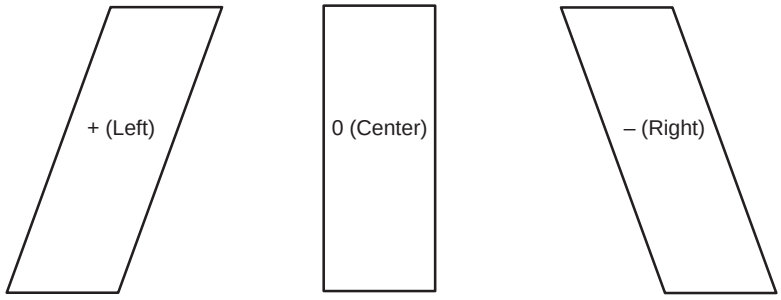


Figure 5–22. Slant Scan Cursor Selections

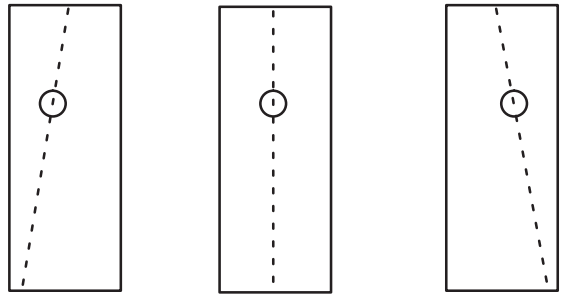


Figure 5–23. B-Mode Display with Slant Selection

PW Doppler Mode Sub-Menu Page 1 (cont'd)

	Wall Filter	Sample Volume (SV) Length
Description	Removes the low level, low frequency Doppler signal caused by movement of the vessel walls. (Also found in the CWD soft menu.)	Changes the size of the sample volume gate length. *NOTE: Adjustments to the sample volume gate size are made from the center point of the sample volume position. A larger gate will increase the spectral broadening affect to the spectrum.*
Benefits	Eliminates unnecessary information. Filters out low level noise above and below the baseline so it cannot be seen or heard on the spectrum.	A smaller gate produces accurate sampling results because it is more sensitive. The gate can be enlarged if there are problems hearing the Doppler audio or for sampling large chambers.
Values	The value can be displayed as velocity or frequency (Setup/Custom Display page 13). Wall Filter cutoff values are selected as cm/s in Setup/Custom Display page 4. 1.0, 2.0, 3.0, 5.0, 7.0, 10, 15 or 20 cm/sec. The values could go as high as 50 cm/s depending on the probe and the velocity scale. Pre-processing function.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14 and 16 mm. Pre-processing function.
Affects on Other Controls	Wall filter changes with velocity scale.	
Bioeffects **Acoustic Output Hazard**		Adjusting this control may cause minor changes in acoustic output. Observe the output display for possible effects.

PW Doppler Mode Sub-Menu Page 2

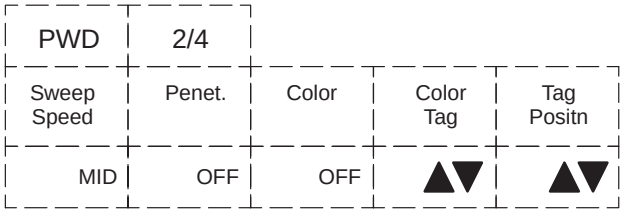


Figure 5–24. PW Doppler Mode Sub-Menu Page 2

	Sweep Speed	Penetration (Penet.)
Description	Changes the speed at which the timeline is updated. (Also found in the CWD soft menu.) *NOTE: Time or distance measurements are not allowed across sweep speed changes.*	Penetration can be increased by lowering the operating frequency of the active probe. For reference, Doppler frequencies (with penetration On or Off) are shown according to probe in Table 5–7 on *5–46*.
Benefits	Speed up or slow down the spectrum for analysis to record more or fewer occurrences over time.	Allows for a slight increase in penetration without changing gain or acoustic output.
Values	Slow (16 sec), Mid (8 sec), Fast (4 sec) and Very-Fast (2sec). Very-Fast is a function in Doppler mode only. Pre-processing function.	On or Off. Pre-processing function.
Affects on Other Controls	If more cardiac cycles are seen, the spectrum appears smaller; if less are seen, the spectrum appears larger or more spread out.	Acoustic output, gain and TGC may be able to be reduced due to increased penetration.
Bioeffects		Decreasing the probe transmitting frequency, without decreasing acoustic output, tends to increase Mechanical and Thermal Index values. However, improved penetration should allow for decreasing patient exposure time.

PW Doppler Mode Sub-Menu Page 2 (cont'd)

	Color	Color Tag
Description	Color allows for enabling pulsed wave Doppler Mode image colorization. (Also found in the CWD soft menu.)	Color tag enables the colorization of a specific gray scale level range. This causes the specified gray levels to be displayed as a predetermined color in the pulsed wave Doppler Mode image. (Also found in the CWD soft menu.)
Benefits	Displaying the gray scale as shades of color may allow for improved differentiation between echo levels.	Allows for the quick recognition of specific gray levels by colorization.
Values	On or Off. The PW Doppler color presented is a selection in the Set Up/Custom Display menu page 13. Post-processing function.	On or Off. The color tag size presented is determined by the Set Up/Custom Display menu page 13. Post-processing function.

	Tag Position (Positn)
Description	Tag position allows for the movement of the specified color tag range throughout the gray scale displayed. (Also found in the CWD soft menu.) If the Color Tag selection is not enabled when **Tag Positn** is selected, **Color Tag** is automatically activated.
Benefits	Allows for setting the color tag to the desired level of gray scale colorization.
Values	Move the color tag up or down the gray scale. Color and size of the tag is determined in the Set Up/Custom Display menu page 13. Post-processing function.

PW Doppler Mode Sub-Menu Page 3

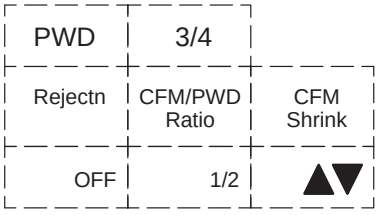


Figure 5–25. PW Doppler Mode Sub-Menu Page 3

	Rejection (Rejectn)	CFM/PWD Ratio
Description	Rejection allows for the elimination of low level echoes from the display. This is generally used to clear noise out of vessels or cysts. (Also found in the CWD soft menu.)	CFM/PWD Ratio is active in triplex mode. It is used to set the velocity ratio between PWD and CFM.
Benefits	Allows for the elimination from the display image of low level echoes caused by noise.	Used to optimize frame rate in Triplex mode. Without changing CFM or PDI velocity scale, PWD velocity scale can be changed to decrease aliasing.
Values	Off and 4 through 40 in increments of 4. Post-processing function.	Choose from 1/1, 1/2 or 1/4. 1/1 CFM and PWD Velocity the same. 1/2 PWD Velocity twice the CFM Velocity. 1/4 PWD Velocity four times the CFM Velocity.
Affects on Other Controls	Rejection affects real-time imaging, frozen, Cine, or VCR playback images.	Affects display frame rate.

	CFM Shrink
Description	Reduces the CFM window to the size specified in Set Up/Custom Display page 4. CFM Shrink can be turned on/off in Setup/Custom Display page 4.
Benefits	Used to optimize frame rate in Triplex mode.
Values	When On is selected, CFM Window size is set by the value selected in Set Up/ Custom Display page 4. When Off is selected, CFM window size is adjusted by scan area function.
Affects on Other Controls	Affects display frame rate.

PW Doppler Mode Sub-Menu page 4

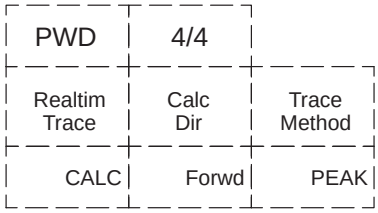


Figure 5–26. PW Doppler Mode Sub-Menu Page 4

	Realtime Trace	**Calc Dir.**
Description	Automatically traces (real-time) the parameter selected in the Set Up/Custom Display Menu page 13. The choices are Peak, Floor, Mean, and Mode. (Also found in the CWD soft menu.)	Choose which part of the Doppler Trace will be used for automatic measurements/ calculations. (Also found in the CWD soft menu.)
Benefits	No need to manually trace a selected value. Measurements and calculations will be automatic.	Easy access to change which portion of the Doppler Trace is used for automatic measurements/calculations.
Values	OFF RealTime Trace is turned off. ON RealTime Trace is active. *NOTE: If the Realtime Doppler Calculation option is not installed, the CALC selection will not be available.* CALC RealTime Trace is active and measurements/calculations are displayed. Trace and calculations are done internally, even if RealTime Trace is turned off. After the image is frozen, change the RealTime Trace to ON or CALC to display the trace and calculations.	Compo Composite—Uses both forward and reverse flow data. Fored Forward—Trace only data towards the transducer. Revrs Reverse—Trace only data away from the transducer.
Hints	The best Doppler data is collected when parallel to flow, with orientation also parallel to the anatomic target; whereas, the best B-Mode image data is collected perpendicular to the anatomic target. Therefore, there usually is not both an ideal B-Mode image and ideal Doppler data simultaneously.	

PW Doppler Mode Sub-Menu Page 4 (cont'd)

	Trace Method
Description	Choose which method is used to trace the Doppler waveform in realtime. (Also found in the CWD soft menu.)
Benefits	Front panel access through the VFD to change trace method.
Values	Select the default parameter to be traced in the Set Up/Custom Display menu page 13. Peak Peak or highest values Floor Bottom or lowest values and peak Mean Average values and peak Mode Brightest echo trace and peak

Doppler Mode Optimization

Doppler Mode Optimization			
Adjustments for...	**Do the Following...**	**Adjustments for...**	**Do the Following...**
Increase Sensitivity	1. Increase **GAIN**. 2. Increase **ACOUSTIC OUTPUT**. 3. Decrease **VELOCITY SCALE** (if flow state allows it). 4. Increase **S.V. Length**. 5. Use lower frequency probe or use lower Doppler frequency on some applications. 6. Activate **B-PAUSE** to freeze B-Mode image. *Scan angle is critical to Doppler sensitivity.*	Improve Display Aesthetics	1. Activate **B PAUSE** to freeze B-Mode image. 2. Decrease **GAIN**. 3. Increase **ACOUSTIC OUTPUT**. 4. Use smaller sample volume size, whenever possible. 5. Increase/decrease **Dynamic Range**. 6. Adjust **BASELINE SHIFT** and **VELOCITY SCALE** to adjust spectral size. 7. Lower Doppler **Sweep Speed**.
Increase Spectral Clarity	1. Activate **B PAUSE** to freeze B-Mode image. 2. Increase **ACOUSTIC OUTPUT**. 3. Decrease **S.V. Length**. 4. Decrease **GAIN**. 5. Decrease **Dynamic Range**.		

M-Mode

Introduction

M-Mode is used to determine patterns of motion for objects within the ultrasound beam. The most common use is for viewing motion patterns of the heart.

Be sure to read and understand Acoustic Output considerations for each mode (refer to *Safety* chapter) before adjusting the Acoustic Output control or any control affecting acoustic output.

Reading the M-Mode or Doppler Spectrum Only Display

The following information is displayed on the M-Mode or Doppler mode spectrum image:

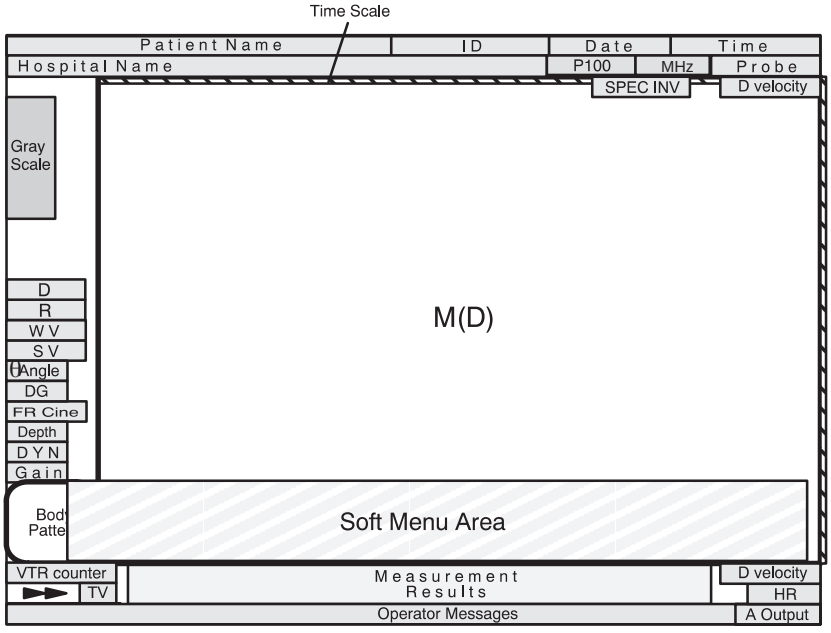


Figure 5–27. M-Mode or Doppler Spectrum Only Display Format

Reading the M-Mode or Doppler Spectrum Only Display (cont'd)

NOTE: Timeline formats (M-Mode and Doppler) available for display are enabled on the Set Up/Custom Display screen menus.

First, choose the Side/Side or Top/Bottom display style on Custom Display page 12, "Timeline Format". The two styles cannot be mixed.

Second, choose the default settings for the M-Mode format selections on Custom Display page 12.

Reading the Dual Doppler Spectrum Only Display

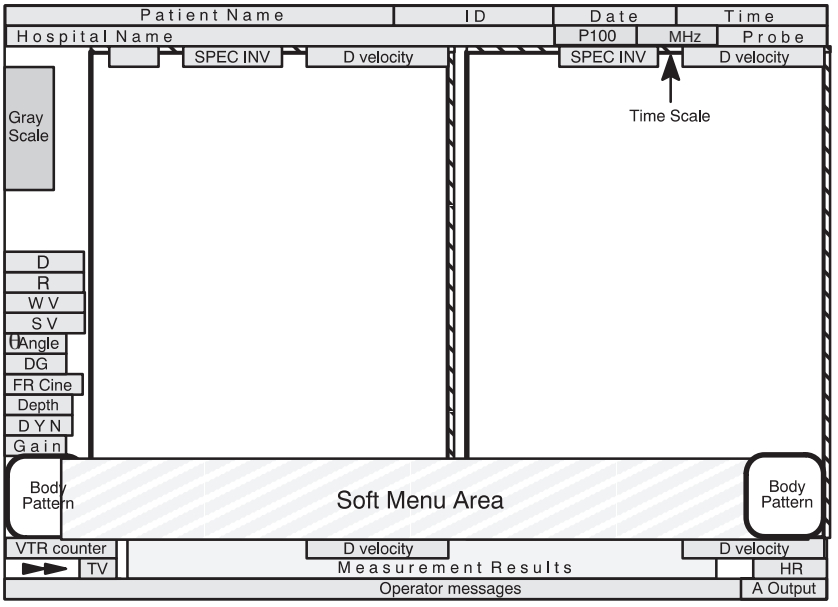


Figure 5–28. Dual D-Mode Display Format

NOTE: Dual M-Mode format is not currently available.

Optimizing the Timeline

Common Controls

Description

Since M-Mode is basically a single B-Mode scan vector displayed over time, basic controls that affect the B-Mode display also affect the M-Mode display.

TGC, depth and B/M Gain affect both the M-Mode and B-Mode displays.

Scan area size, scan area position and reverse affect B-Mode only.

If the scan area size is reduced and the position changed, the M-Mode cursor will follow the position change to stay within the displayed scan area.

The Dual Format Keys (L–R) work the same as in dual B-Mode, but display both B-Mode and M-Mode on the left and right side of the screen.

Accessing/Changing

See the *B-Mode* section of this chapter for details on these controls.

Controls

	M/D Cursor	Zoom (M-Mode)
Description	Entering M-Mode automatically assigns trackball control to the M/D Cursor.	Acoustic zoom can be accomplished while in M-Mode. The B-Mode reference image does not zoom but the M-Mode display will enlarge. Display (freeze) zoom is not available with M-Mode. See Figure 5–29.
Accessing/ Changing	To enable trackball control of the M/D cursor, press the **M/D Cursor** key. The M-Mode cursor line changes color. To terminate trackball control of the M/D cursor, press **Set**. The M-Mode cursor line changes color.	To access zoom while in B/M-Mode, press the **Zoom** key. Rotate the **Zoom Size** control to adjust the size of the zoom area cursors. Use the **Trackball** to move the zoom area vertically along the M-Mode cursor line. Press **Set** to fix the zoom function and continue scanning. Press **Clear** to exit the zoom function.
Benefits	Allows for repositioning of the M-Mode cursors after the trackball has been assigned a different function.	Allows for expanding a region of interest over the entire M-Mode timeline display.
Values	On or Off. The M-Mode cursor displays in the center of the screen or changes to the active color if already present.	Acoustic zoom has magnification values of 1, 1.2, 1.5, 2, 2.5, 3.0 and 4.0. The default value is set in the Set Up/Custom Display menu page 1.
Affects on Other Controls	Terminates trackball control from its current function and assigns it to the M-Mode cursor.	Changes the transmit focal point position when moved vertically.
Bioeffects **Acoustic Output Hazard**		Moving the focal zone affects acoustic output by bringing the near field closer and by adding focal zones. The amount of increase varies depending on the probe and its frequency. Adding focal zones tends to increase TI, although it may decrease MI. Observe the output display for possible effects.

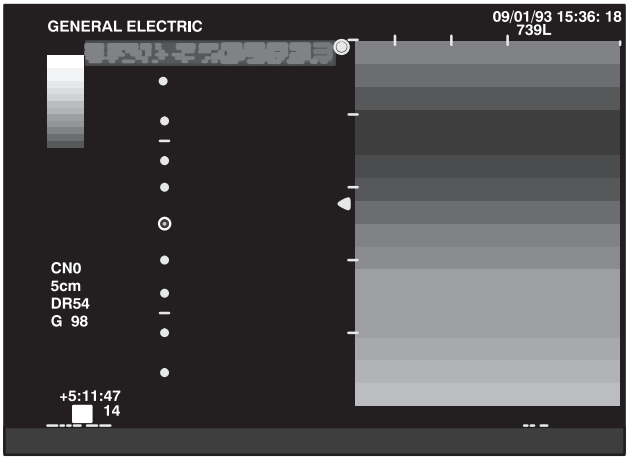


Figure 5–29. Zoom (M-Mode) Display

M-Mode Sub-Menu Page 1

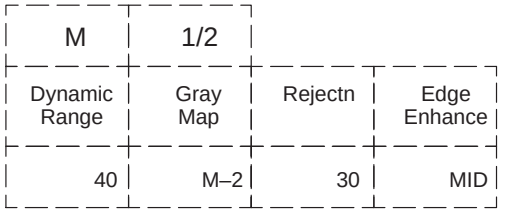


Figure 5–30. M-Mode Sub-Menu Page 1

	Dynamic Range	Gray Scale Mapping (Gray Map)
Description	Controls how echo intensities are converted to shades of gray, thereby creating a range of gray scale that can be adjusted. Adjustments to M-Mode's dynamic range affects the M-Mode timeline only.	Gray scale mapping determines how the echo intensity levels received are presented as shades of gray.
Benefits	Dynamic range is useful for optimizing tissue texture to differentiate between echo levels that are close together. Dynamic range should be adjusted so that the highest amplitude edges appear as white while lowest levels (such as blood) are just visible.	Displays the received echo levels with different weights on specific levels of gray. For example, a certain gray map may enhance mid level echoes over a wider range of grays verses high or low level echoes. Allows for better differentiation between echo levels through gray levels displayed.
Values	The settings cycle in 6 dB steps from 30 dB to 90 dB. The default for M dynamic range is set in the Set Up/Custom Display menu page 3. Dynamic range levels are returned to the preset value when changing the following: • Probe • Exam category • New patient Pre-processing function.	There are 6 selections of gray scale mapping. Post-processing function.
Affects on Other Controls	Operates only in real-time, not in freeze, Cine, Timeline replay, or VCR playback.	

M-Mode Sub-Menu Page 1 (cont'd)

	Rejection (Rejectn)	Edge Enhance
Description	Deletes low level echoes.	Brings out subtle tissue differences and boundaries by enhancing the gray scale differences corresponding to the edges of structures. Adjustments to M-Mode's edge enhancement affects the M-Mode timeline only.
Benefits	Higher rejection values will remove weak, low level echoes in a displayed image.	Modifies the M-Mode image by accentuating the interfaces between organs or vessels.
Values	Off and 2 through 40 in increments of 2. Rejection is a post-processing function.	The four selections are Off, Low, Mid and High. The default for M Edge Enhance is set in the Set Up/Custom Display Menu page 3. Edge enhance levels are returned to the preset value when changes are made to the following: • Application • Exam category • New patient Pre-processing function.
Affects on Other Controls	Functions in real-time, as well as in freeze, Cine, or VTR playback.	Operates in real-time only, not in freeze, Cine, or VCR playback.

M-Mode Sub-Menu Page 2

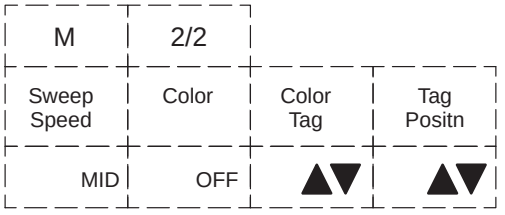


Figure 5–31. M-Mode Sub-Menu Page 2

	Sweep Speed	Color
Description	Changes the speed at which the timeline updates across the display. *NOTE: Time or distance measurements are not allowed across sweep speed changes.*	Allows for enabling M-Mode image colorization.
Benefits	Speed up or slow down the timeline in order to view more or fewer occurrences over a period of time. A fast speed shows less cycles but better transition definition. A slow speed shows more cycles but less definition during transitions.	Displaying the gray scale as shades of color may allow for improved differentiation between echo levels.
Values	Slow (16 sec), Mid (8 sec) and Fast (4 sec). Pre-processing function.	On or Off. The M-Mode color presented is a selection in the Set Up/Custom Display menu page 12. Post processing function.
Affects on Other Controls	If more events are seen, the timeline appears smaller; if less events are seen, the timeline appears larger or more spread out.	

M-Mode Sub-Menu Page 2

	Color Tag	Tag Position
Description	Enables the colorization of a specific gray scale level range. This causes the specified gray levels to be displayed as a predetermined color in the M-Mode image.	Allows for the movement of the specified color tag range throughout the gray scale displayed.
Benefits	Allows for the quick recognition of specific gray levels by colorization.	Allows for setting the color tag to the desired level of gray scale colorization.
Values	On or Off. The color tag size presented is determined by the Set Up/Custom Display menu page 12. Post-processing function.	Move the color tag up or down the gray scale. Color and size of the tag is determined in the Set Up/Custom Display menu page 12. Post processing function.

M-Mode Optimization

M-Mode Optimization			
Adjustments for...	**Do the Following...**	**Adjustments for...**	**Do the Following...**
Improve M-Mode	1. Increase/decrease **B/M GAIN**. 2. Increase **Dynamic Range**.	Increase Size of Area of Interest	1. Use M-Mode **ZOOM**.

3DvieW Mode
(Option)

Overview

A 3D image can be rendered or constructed from the cine data collected during a normal scan by using a process called MIP (Maximum/Minimum Intensity Projection).

When the scan data is properly collected MIP images can be used to display vascular structure using the Advanced Velocity Maps. MIP imaging is not a real-time function, but a post-processing function.

CAUTION

This 3DvieW option is designed for qualitative information only and has no provision for any measurement or computation ability.

No specific reconstruction resolution or accuracy is provided or claimed for this option.

CAUTION

Since positional information of the original scan is not available, all measurement functions cannot be performed on a MIP image. Information concerning the front or back of the MIP image may be uncertain.

Caution should be taken when viewing the MIP image due to the fact that the algorithm used in the MIP process may produce a skewness to the MIP image displayed.

NOTE: Consider all of the above cautions when using MIP images to evaluate a patient. MIP images should not be used for quantitative information but a qualitative supplement to all other diagnostic data collected for that patient.

Refer to the *Advanced Reference Manual* for further details.

3D-Surface Mode
(Option)

Overview

This option creates a projected image different from 3DvieW. It uses images stored in Cine. The calculation used for the projection is based on the transmission principle of light using Volume-Rendering.

This function is available only in single B-Mode.

The 3D-Surface option is necessary before installing the 3DvieW option. Refer to 3DvieW Mode section as needed.

CAUTION

This 3D-Surface option is designed for qualitative information only and has no provision for any measurement or computation ability.

No specific reconstruction resolution or accuracy is provided or claimed for this option.

CAUTION

Since positional information of the original scan is not available, all measurement functions cannot be performed on a 3D-Surface image.

NOTE: Consider all of the above cautions when using 3D-Surface images to evaluate a patient. 3D-Surface images should not be used for quantitative information but a qualitative supplement to all other diagnostic data collected for that patient.

Refer to the *Advanced Reference Manual* for further details.

Mixed Mode Display Formats

Display Formats

Some possible display formats are:

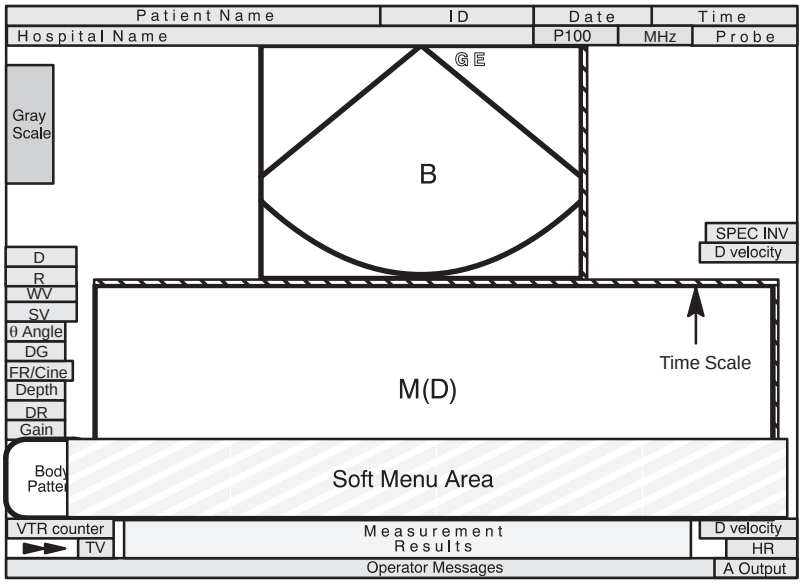


Figure 5–32. Top/Bottom B Mid Preset

Display Formats (cont'd)

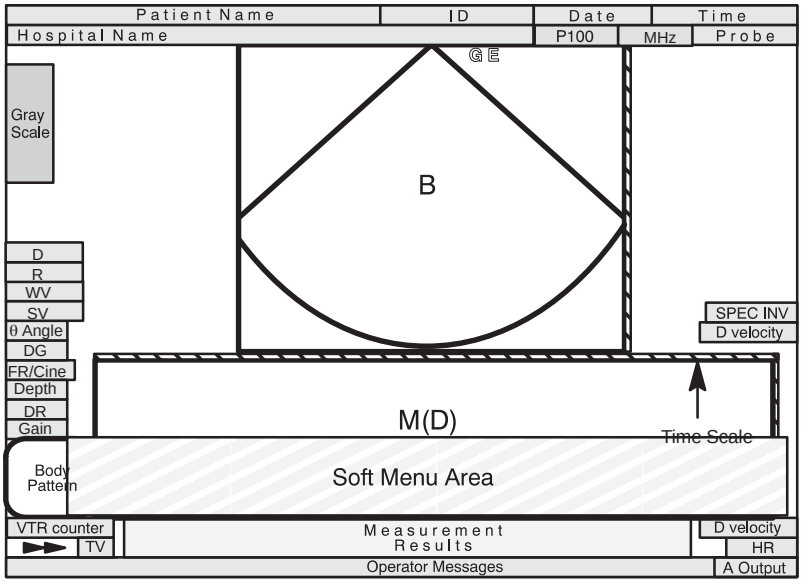


Figure 5–33. Top/Bottom B Large Preset

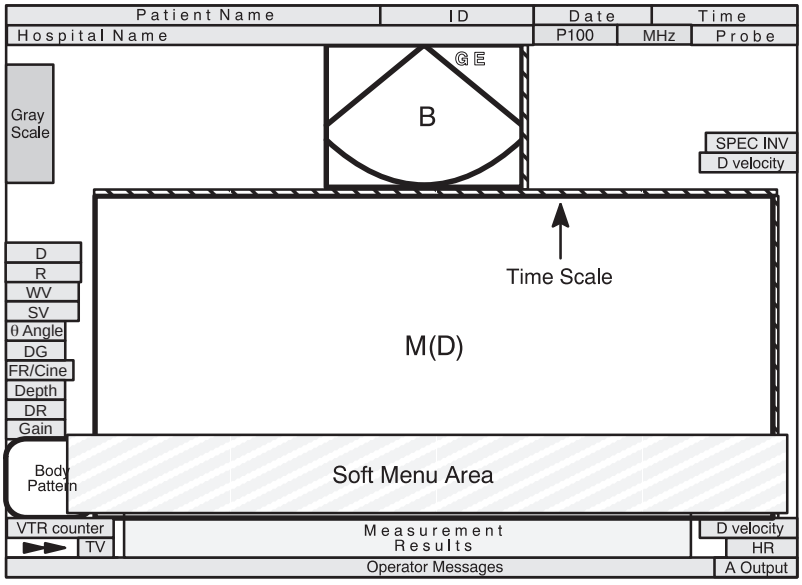


Figure 5–34. Top/Bottom B Small Preset

Display Formats (cont'd)

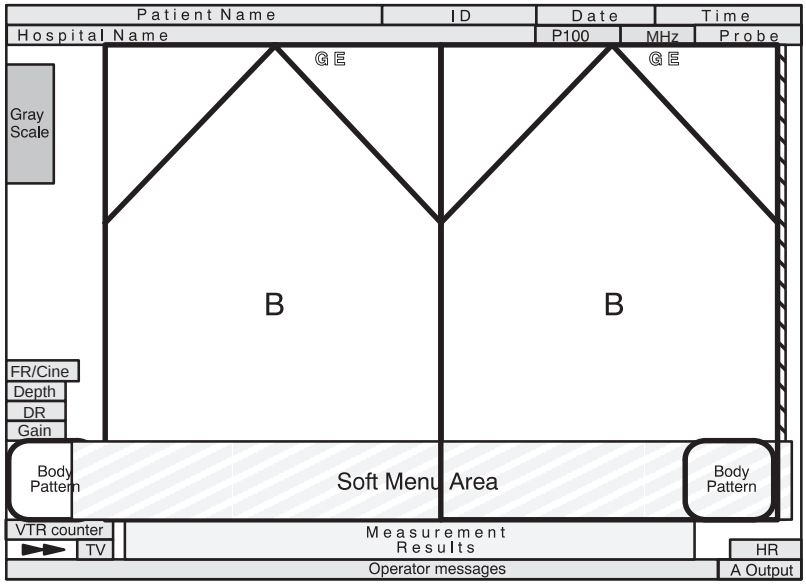


Figure 5–35. Dual B-Mode Display Format

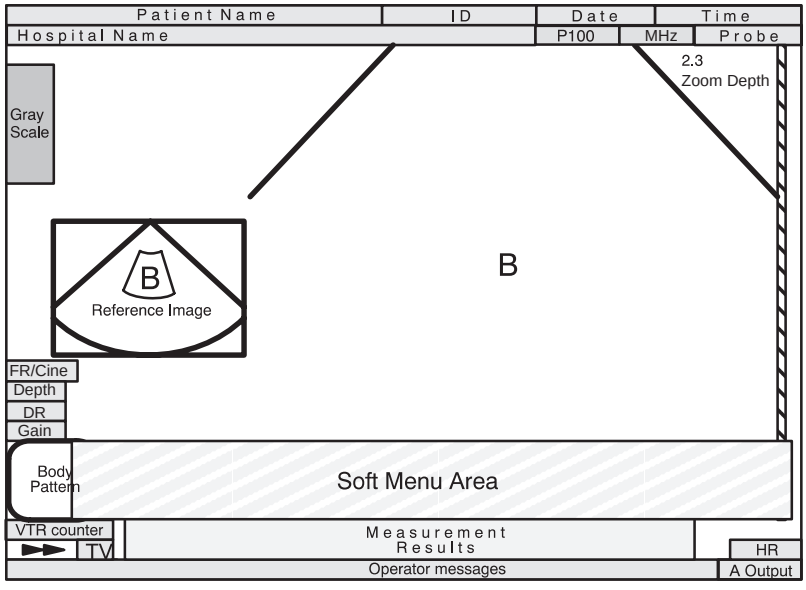


Figure 5–36. Zoom with Reference Mode Display Format

Display Formats (cont'd)

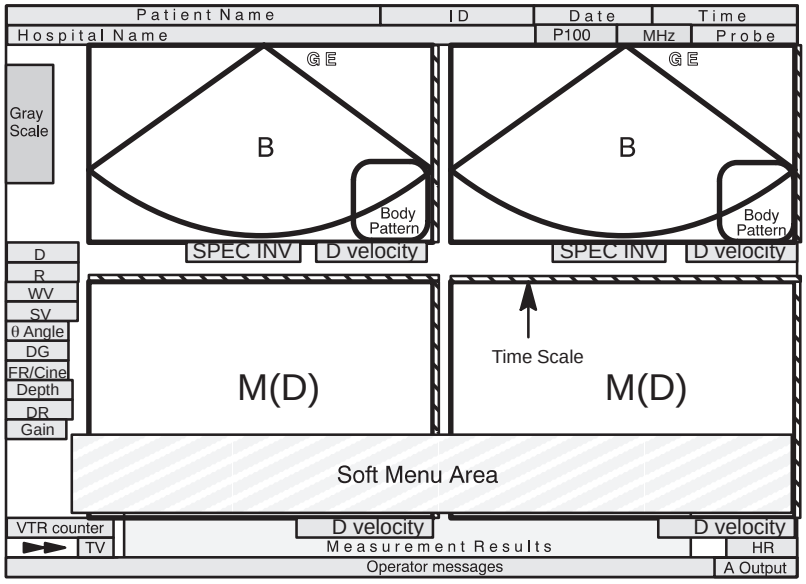


Figure 5–37. Dual Format

Zooming an Image

Introduction

Zoom is used to magnify a specified region of interest (ROI). The system adjusts all imaging parameters accordingly. Decreasing the size of the ROI increases the magnification factor.

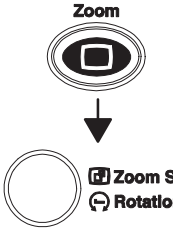
Cine and VCR playback images must be frozen to be zoomed.

Zoom Methods

The LOGIQ™ 400 offers two types of zoom capabilities, Acoustic (real-time) Zoom and Display (freeze) Zoom.

Acoustic Zoom

Acoustic Zoom is accomplished while scanning live (real-time).

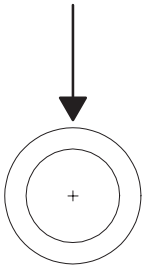


While scanning, press the **Zoom** key to activate the zoom function.

Rotate the **Zoom Size** control to the desired magnification. The magnification choices available are:

1.2, 1.5 (default), 2.0, 2.5, 3.0 and 4.0

The default value can be set in Set Up/Custom Display page 1 “Zoom Factor”.



Use the **Trackball** to position the zoom region of interest.

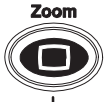
Press **Clear** or **Zoom** to cancel the zoom function.

Display Zoom

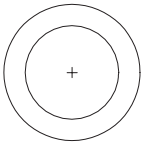
Display (freeze) Zoom is accomplished after the image is frozen. This applies to the current image, a Cine image or a VCR playback image.

The magnification factor for Display Zoom is fixed at 2.0.

Press **Freeze** to stop image acquisition.



Press **Zoom** to activate the zoom function.



Use the **Trackball** to pan around the image area.

Press **Clear** or **Zoom** to cancel the zoom function.

NOTE: If an acoustic zoom image is frozen, display zoom will not function.

Hints

The zoomed image can be panned around the B-Mode image by moving the **Trackball**.

Measurements can be performed on zoomed images.

Changing the depth does not affect the zoomed image, unless the zoomed area is no longer contained within the new depth.

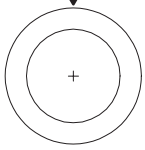
TGC pots within the zoom ROI are active (and these pots' LEDs light up). When zoom is exited, the 8 TGC pots are reproportioned to the displayed depth scale.

Zooming an M-Mode Image

If the **Zoom** key is pressed while in B/M-Mode, only the M-Mode image will be zoomed.

Press **Zoom** to display a magnified M-Mode image and a M-Mode zoom marker in the B-Mode image.

Adjust the **Zoom Size** control to the desired magnification factor. The six steps are the same as B-Mode.



Use the up/down movement of the **Trackball** to move the Zoom Markers vertically along the M-Mode cursor.

Use the side to side movement of the **Trackball** to move the M cursor and Zoom cursor throughout the image.

Press **Clear** or **Zoom** to cancel the zoom function.

NOTE: Display Zoom does not function on a frozen B- and M-Mode Timeline Image.

Multi–Image Zoom

When using the Zoom function in a multiple image display format, a few basic rules apply.

- Display Zoom (Freeze) can be performed on any or all of the multiple images.

Figure 6–1. Dual Format Display Zoom

- A frozen acoustic zoom and active acoustic zoom can be displayed simultaneously.

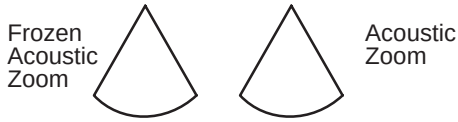


Figure 6–2. Dual Format Display, Frozen and Active

- Acoustic Zoom and Display Zoom cannot be mixed on the same display.

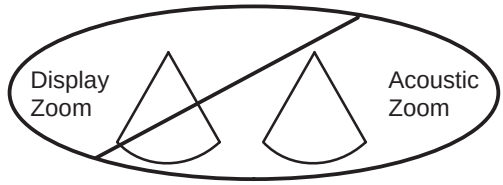


Figure 6–3. Dual Format Display/Acoustic Zoom Unavailable

Freezing an Image

Introduction

Freezing a real-time image stops all acquisition of information into system memory.

This allows for measurements, annotations, printing or storage of images into temporary memory.

VCR playback images can also be frozen for similar reasons.

Post processing of the image

The following post processing image parameters can be changed to affect the appearance of a frozen image:

- Display Zoom (x2 only)
- Reject
- Color (B Color or CFM Color Maps)
- Gray Scale Map Selection
- Image Rotation
- Color Tag

Freezing an Image (Freeze Key)

To freeze an image:

- Press **Freeze**. The key backlights.

NOTE: If both B- and M-Modes are active, the B-Mode and timeline trace stops immediately. Use the Cine Scroll Control to start CINE review.

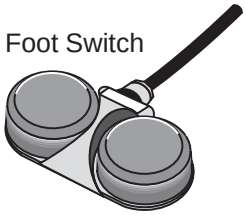
To reactivate the image:

- Press **Freeze** again. Deactivating Freeze restarts the B-Mode and timeline after a black and white bar indicating discontinuity is inserted in the timeline (M-Mode Display).

NOTE: Deactivating Freeze erases all measurements and calculations from the display (but not from the report page).

Selecting a new probe unfreezes the image.

Freezing an Image (Foot Switch option)



Toggle **Freeze** on and off by pressing the foot switch. Pressing the left foot switch backlights the **Freeze** key on the console.

Using Cine

Introduction

Cine is useful for focusing on images during a specific part of the heart cycle or to find an image before the patient moved or breathed.

Cine images are constantly being stored by the system. Cine memory capacity is 31 (0–30) frames with 128 scan lines. The Cine Memory stores the most recent data available for playback or manual review via Cine. The amount of time represented depends on the system's frame rate, scan mode, image size and other parameters.

Timeline data is continually stored at four times the display width of timeline data (and updates the corresponding B-Mode images).

View Cine as a continuous loop via Cine Loop or manually review Cine images frame by frame via the Cine Scroll Control.

Data in Cine is available until new data is acquired. Cine is stored in the system's memory and can be transferred to image memory, video page printer, multi-image camera or optional optical disk (MOD).

An Extended Cine Memory Option is available to increase Cine storage capabilities.

Cine memory

Cine memory is erased when changing the following:

- Probe
- Scan Mode
- Depth
- Display format (zoom, dual, rotate)
- Timeline Sweep Speed (D/M-Modes)
- Changing the PWD Velocity Scale (spectrum only)
- Changing the Color Flow Velocity Scale

Cine functionality

Post Processing functions can be performed while in Cine such as:

- Measurements and calculations
- Color Baseline shift
- B Color
- Color Flow Velocity Tag
- Color Flow Display Threshold
- CFM Spectrum Invert
- Zoom
- Rejection
- Gray Scale Maps
- Edit annotations

Accessing Cine

To access and manually review Cine:

1. Press **Freeze**.

*NOTE: One click of the **Cine Scroll** knob erases displayed measurements.*

2. Rotate the **B/M Gain/Cine Scroll** knob to activate Cine.
3. Rotate the **Cine Scroll** dial left (backward) and right (forward) to move through the images in Cine memory.
4. The current frame on the Cine gauge moves and the Cine frame number is displayed on the lower left side of the screen, above the depth.

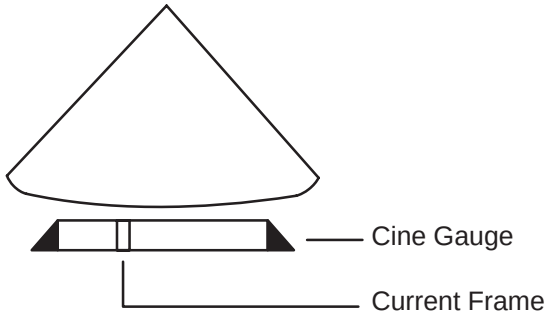


Figure 6–4. Cine Gauge Display

NOTE: Cine frame number 0 is the most current image. The higher the Cine frame number, the older the image.

Depth, dynamic range, and gain parameters are valid for Cine frame number zero only.

Using Cine Loop

Specify which sections of Cine memory to playback by creating a Cine Loop.

To create a Cine Loop:

1. Press **Freeze**. The key backlights.
2. Rotate the **Cine Scroll** dial to the desired starting position in Cine memory. Display the Cine Sub Menu.

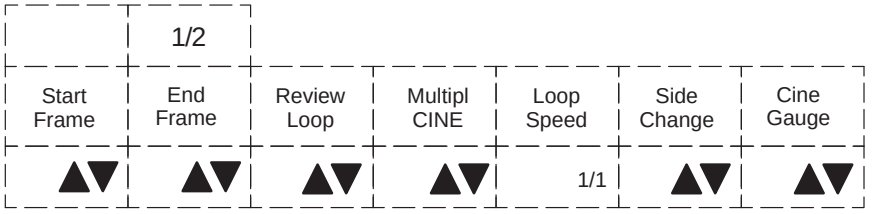


Figure 6–5. Cine Sub-Menu

3. Select **START FRAME** on the Cine Sub-Menu.

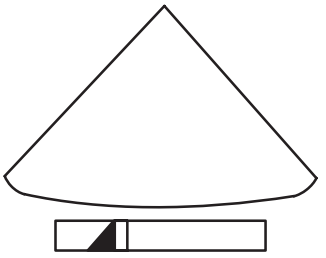


Figure 6–6. Cine Gauge Frame Start

4. Rotate the **Cine Scroll** dial to the desired ending position in Cine memory.
5. Select **END FRAME** on the Cine Sub-Menu.

Using Cine Loop (cont'd)

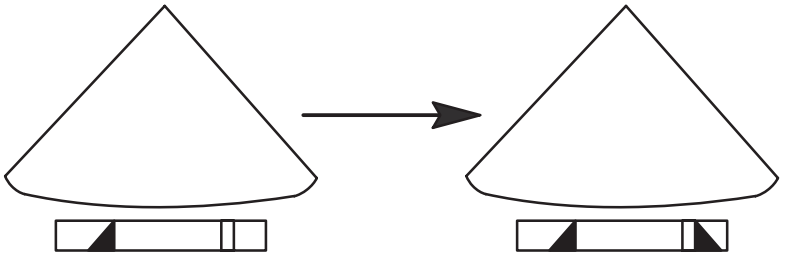


Figure 6–7. Cine Gauge Frame End

6. Select **REVIEW LOOP** on the Cine Sub-Menu.

Cine Review Loop playback begins right away at the selected speed.

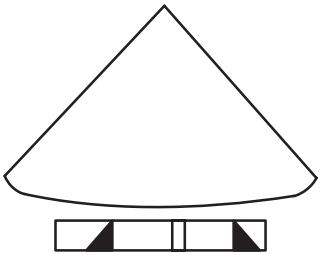


Figure 6–8. Cine Loop Operation

NOTE: Cine Loop is not available during Timeline Review.

To deactivate Cine Loop:

- Select **REVIEW LOOP** on the Cine Sub-Menu or turn the Cine Scroll knob. This returns to manual Cine review.

To reactivate Cine Loop:

- Select **REVIEW LOOP** on the Cine Sub-Menu.

Cine Loop Speed

To adjust the speed of viewing Cine Loop playback, access **LOOP SPEED** from the Cine Sub-Menu.

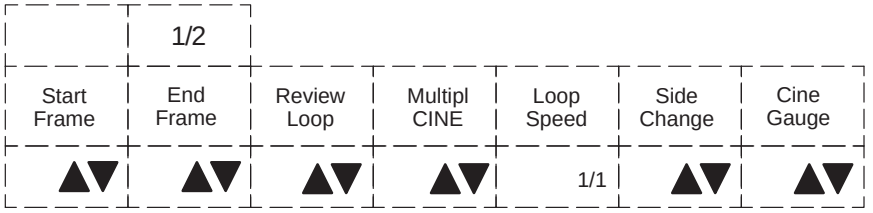


Figure 6–9. Cine Sub-Menu

NOTE: Cine cannot be viewed faster than real-time.

Each press of the **Sub Menu Select** arrow key cycles to the next speed setting (1/1, 1/2, 1/4 or 1/8).

Multipl CINE

The Multipl CINE Soft-Menu selection is used in Dual B-Mode Cine Operation.

With Multipl CINE on (menu highlighted), Cine review of the two B-Mode images can be done simultaneously.

With Multipl CINE off, Cine review is done separately using the **L/R** keys to designate the active Cine image.

Review with Multipl CINE on/off can be accomplished with the **Cine** knob or review loop.

Side Change

This menu selection is used with B/M (D)-Mode imaging.

Side Change is used to toggle between B image Cine scroll and Timeline (M/D) Cine scroll.

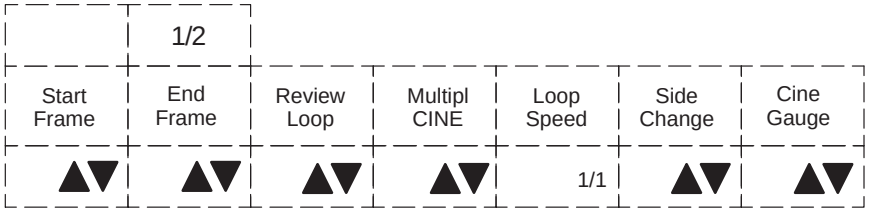


Figure 6–10. Cine Sub-Menu

CINE Gauge

Used to toggle the Cine gauge graphic display on or off.

CINE Capture (option)

CINE Capture is a post processing version of the Capture selection in the CFM/PDI sub-menu.

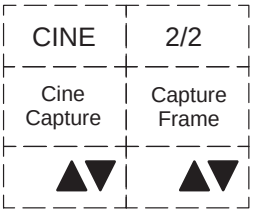


Figure 6–11. Cine Sub-Menu

Selecting **CINE Capture** will search through all images between the start frame and end frame and display each peak or the highest velocity. Adjust the start frame and end frame points to limit the image frames used in the process.

Capture Frame (option)

Capture frame can be used to eliminate specific image frames from the Cine Capture process.

Use the **Cine Scroll** knob to display an image frame to be eliminated, and select **Capture Frame**. A small mark will be displayed on the Cine gauge. Do this for all images that are not to be included in the Cine Capture process. When all frames to be eliminated are marked, select **Cine Capture** to display the peak velocity detected color image.

Exiting Cine

To exit Cine, press **Freeze**.

Helpful Hints

Hints

The following hints can help when freezing an image:

- Color, multi-format or M/D images take up more memory than normal B-Mode. Therefore, less frames of information are available for Cine storage.

ECG/Cine Gauge/Image Tracking

When an ECG waveform is displayed with the cine gauge, an arrow pointer appears above the ECG waveform.

As the cine gauge marker is moved with the Cine Scroll control, the arrow above the ECG waveform moves to indicate where on the ECG cycle the displayed image was taken.

Annotating an Image

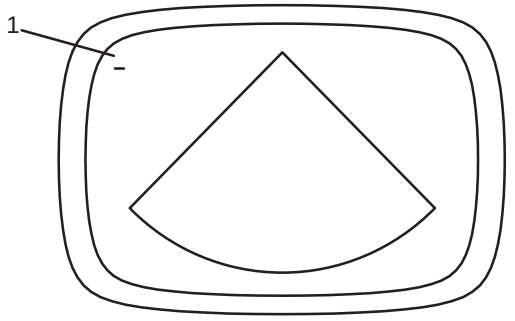
Introduction

The annotation keyboard is always active. Upon starting a new patient or power up, the underscore cursor appears in the mode's home position. Annotation can commence after using the Trackball to specify where the comment should start.

Pressing the **Comment** key assigns the trackball function to controlling the cursor and displays the annotation library in the soft menu.

The Comment key enables the image text editor and displays the annotation library soft menu. After the **Comment** key is pressed, text can be added through the Soft Menu comment library or by typing comments from the alphanumeric keyboard. Turning off the cursor can be done by pressing the **Set** key. Pressing the **Clear** key erases all comments.

NOTE: If the "Use A/N Keys for User Define" preset in Set Up/System Parameters page 3 is ON, the Comment key must be pressed first to activate the annotation function.



1 Underscore Cursor or Block

Figure 6–12. Annotation Cursor in Home Position

Introduction (cont'd)

Annotations are input in type-over, not insert, mode. Be careful not to write over text when editing.

NOTE: The comment function will work with any report page. When the cursor is in a field designated for comments, the comment key will illuminate and the annotation library will appear in the Soft Menu. All comment, edit and annotation functions are then available.

All annotations are permanently retained with the image. However, annotations are erased at power down or when **Clear** or **New Patient** are pressed.

In addition, the display's home position can be changed (preferred annotation area) for each display so that all subsequent annotations begin in the same spot.

Cursor Home: Established in Set Up/Preset Program page 1, the cursor returns to the upper left part of the screen or the user specified position.

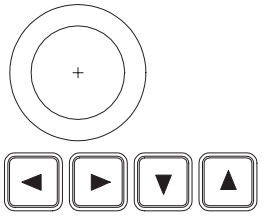
A new cursor home position is established by placing the cursor in the desired position and pressing **Ctrl** and **M**. The new cursor position is placed in the Preset Program values.

To end the Comment/Library annotation function, press **Clear**. Comments will be erased.

"Comment Clear Key Function" is a parameter found in the Set Up/Preset Program page 1. This parameter can be set to erase all comments on the screen or just the comment line the cursor is on. With the line selection, the second time **Clear** is pressed, all comments will be erased.

"Measurement Clear Operation" is a parameter found in the Set Up/Preset Program page 3. This parameter can be set to have only measurements erased with the **Clear** key or measurements and comments.

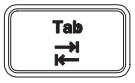
Introduction (cont'd)



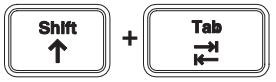
The **Trackball** and **Keyboard Arrow** keys are used to move the cursor to the desired position on the image.

When the blinking cursor is in the desired position, comments may be typed in or a selection can be made from the annotation library.

The **Set** key is used to end the Comment/Library function.



The **Tab** key will move the cursor to the right every eight characters or to the next word depending on the preset parameter. See *6–26* for more details.



Shift and **Tab** moves the cursor in the same manner but to the left.

Annotation Library

To reduce the amount of time spent annotating an image, store often-used annotations in the Annotation (Comment) Library. These scripts can be up to 20 characters in length. As many as 24 scripts can be saved for each user application preset within each exam category.

Entering/Editing the Library

Access the Annotation Library by selecting Set Up/Preset Program.

Pages 7 and 8 of the Preset Program menus will be the 24 annotation library selections.

Use the **Trackball** to move the arrow cursor to the desired Annotation Library location number.

NOTE: Remember the first 8 selections will appear on sub-menu page 1. Annotation Library 9 to 16 will be on sub-menu page 2. Annotation Library 17 to 24 will be on sub-menu page 3.

Press **Set**. The 20 character space for that library location will be in reverse video.

Add or edit the desired script.

Select the next library location and press **Set**.

Continue until all additions or edits are complete.

To save all entries and edits, **Trackball** to the SAVE selection and press **Set**.

The system prompt will read “overwrite existing data? ‘Y’ or ‘N’”. Press ‘**Y**’ to rewrite and save data. Press ‘**N**’ to program a new annotation library.

To avoid saving unwanted changes (all current changes), select RESET and press **SET**.

Displaying annotation scripts

To review the Comment Library scripts:

Press **Comment**. The Library menu for the designated exam category appears.

Use the **Sub-Menu Select** arrow keys to cycle through the three pages of scripts available.

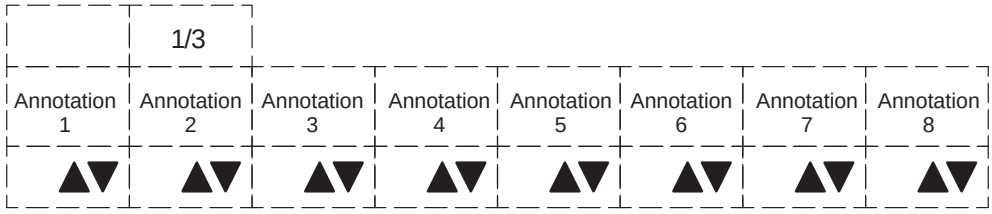


Figure 6–13. Comment Library Sub-Menu Display

The Library Sub-Menu display shows the first 14 characters of each script.

Hints

Print a hard copy of these codes from the Set Up/Preset Program Menus if there are several operators in the department.

There is a space following all programmed annotations. Example: PANCREAS_

Type in the 8 most used scripts first, so that they appear on the first Sub-Menu page.

Adding Comments to an Image

To annotate an image:

- Type comments where the cursor is currently located (the display's home position) or use the **Trackball**/**Arrow** keys to place the annotation cursor in the desired location before typing.
- Press **Return** to move to the next line.

NOTE: Annotations wrap to the next line when they are within one character of the right margin.

The word wrap starts one line below the start of that annotation.

Annotations appear on all prints, photos, and VCR recordings.

Figure 6–14. Next Line Word Wrap

If the cursor appears at the right edge of the lowest line, or a word cannot be completed in the lower right corner, word wrap cannot be executed.

To annotate an image using the Library:

- Press **Comment**. If the comment sub menu does not appear on the screen, press the **Top Menu Select** key.
- Move the annotation cursor to the desired start position using the **Trackball**/**Arrow** keys.
- Use the **Sub-Menu Select** arrow keys, if necessary, to display the desired script.
- Press the **Sub Menu Select** up or down arrow keys to write the library script starting at the position of the cursor.
- The same word wrap principles apply for library scripts as typed comments.

Special Annotation Keys

Some special annotation symbols can be used by activating the **Blue Shift** or **Red Shift** keys. **Red Shift** does not function while **Blue Shift** is active. The Blue Shift and Red Shift keys act as a lock function (similiar to the Caps Lock key).

Special Symbols

Activating **Blue Shift** will cause the **arrow**, **female** and **male** symbols to be printed on the screen during the comment function when the keys shown in Figure 6–15 are pressed.

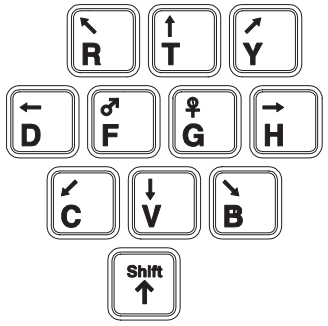


Figure 6–15. Blue Shift Keys

Language–Specific Characters

The Red Shift key enables the special symbols shown in red on the keyboard. The red symbols shown in the lower right portion of a key will print when the **Red Shift** is active. The red symbols shown in the upper half of a key will print if the normal shift key is held down while the **Red Shift** is active.

The following illustrations and tables show the language-specific keyboards and characters. The appropriate language must be set in order to enable the language-specific keys.

The Language presets are found on Set Up/System Parameters page 1. The language change takes effect after the system is turned off and powered up again.

Language–specific characters (cont'd)

To type language-specific characters, while **Red Shift** is active, press the proper keys. For example, to type "À", press "A" and press the " ◌̀ " key while the **Red Shift** is active.

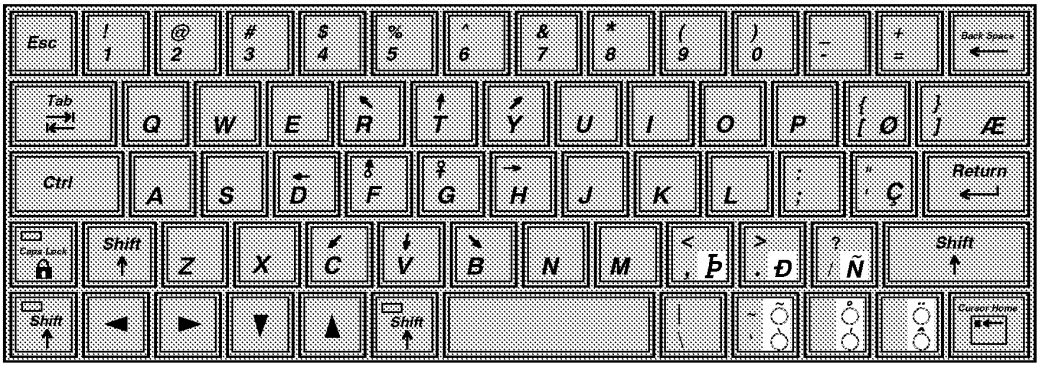


Figure 6–16. Keyboard for English, French, German, Spanish, Italian, Portuguese, Swedish and Danish

	A	E	I	O	U	Y	a	e	i	o	u	y
◌̀	À	È	Ì	Ò	Ù		à	è	ì	ò	ù	
◌́	Á	É	Í	Ó	Ú	Ý	á	é	í	ó	ú	ý
◌̂	Â	Ê	Î	Ô	Û		â	ê	î	ô	û	
◌̃	Ã			Õ			ã			õ		
◌̈	Ä	Ë	Ï	Ö	Ü		ä	ë	ï	ö	ü	ÿ
◌̊	Å						å					

Table 6–1. Language-specific characters for English, French, German, Spanish, Italian, Portuguese, Swedish and Danish

Language–specific characters (cont'd)

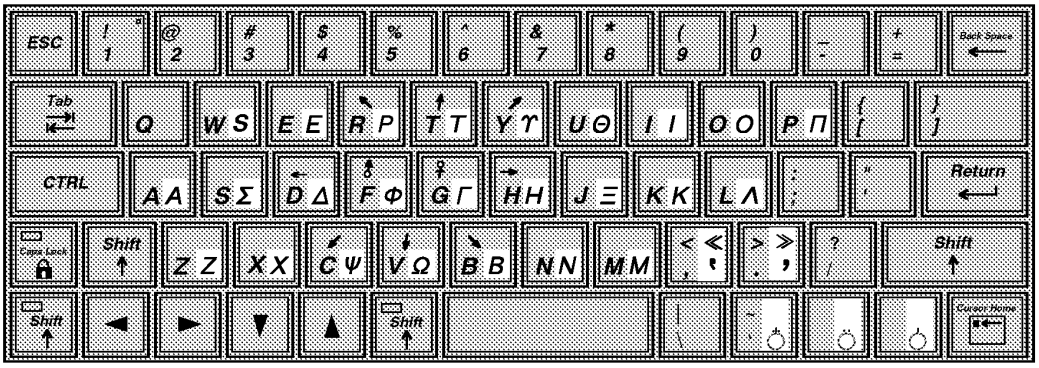


Figure 6–17. Greek Keyboard

	A	E	H	I	O	Y	Ω	α	ε	η	ι	ο	υ	ω
◌́	Ά	Έ	Ή	Ί	Ό	Ύ	Ώ	ά	έ	ή	ί	ό	ύ	ώ

	I	Y	ι	υ
◌̈	Ϊ	Ÿ	ϊ	ϋ

	ι	υ
◌̈́	ΐ	ΰ

Table 6–2. Language-specific characters for Greek

Language–specific characters (cont'd)

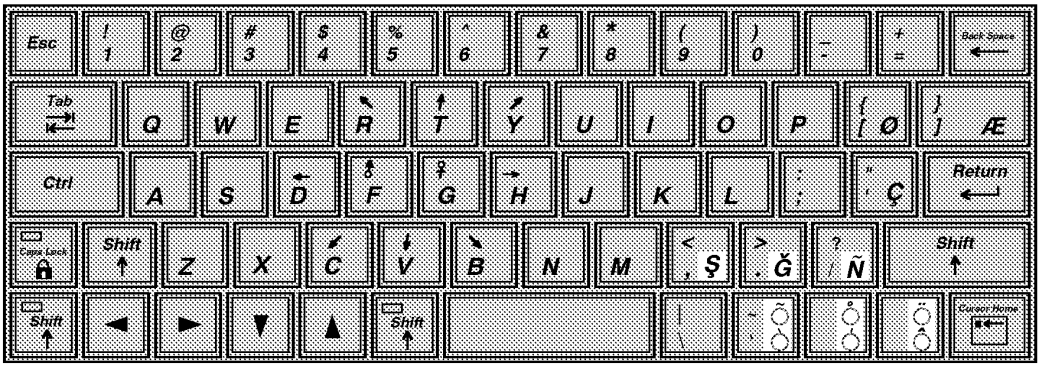


Figure 6–18. Turkish Keyboard

	A	E	I	O	U	a	e	i	o	u	y
◌̀	À	È	Ì	Ò	Ù	à	è	ì	ò	ù	
◌́	Á	É	Í	Ó	Ú	á	é	í	ó	ú	
◌̂	Â	Ê	Î	Ô	Û	â	ê	î	ô	û	
◌̃	Ã			Õ		ã			õ		
◌̈	Ä	Ë	Ï	Ö	Ü	ä	ë	ï	ö	ü	ÿ
◌̊	Å		İ			å		ı			

Table 6–3. Language-specific characters for Turkish

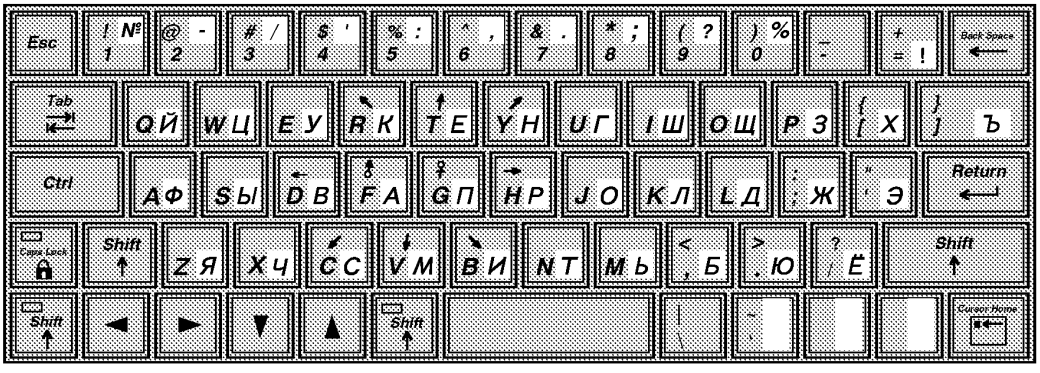


Figure 6–19. Russian Keyboard

Editing Annotations

On screen annotations can be revised. Revision can be accomplished by adding or deleting text, or completely removing all annotations by pressing **Clear**.

Editing while annotating

Backspace over any error(s) made. Blank spaces take the place of the letter(s) that was there. Continue typing the annotation after backspacing over all incorrect letters.

NOTE: Text does not adjust automatically.

To delete previous character(s):

- Press **Backspace** as many times as necessary to make the deletion.
- Retype the annotation from the point where backspacing was stopped.
- Position the cursor and type over existing text.

To move through the text eight characters at a time:

- Press **Tab** to move to the right (Preset Keyboard Tab = Normal).
- Press **Shift** and **Tab** to move to the left.

To move through the text a word at a time:

- Press **Tab** to move to the right (Preset Keyboard Tab = Word)
- Press **Shift** and **Tab** to move to the left.

NOTE: The Tab selection is found on the Set Up/System Parameter menu page 1.

Body Patterns

An additional way to annotate the image display is with body patterns. Body patterns are a simple graphic of a portion of the anatomy that is frequently scanned.

This body pattern is generally displayed in the lower left corner of the screen. Its placement can vary with the format of the display.

Along with the body part graphic is a marker that illustrates the probe position. This marker can be placed with the **Trackball** and rotated with the **Zoom Size/Rotation** control.

The body pattern and probe marker can serve as a reference for patient and probe positioning when images are archived.

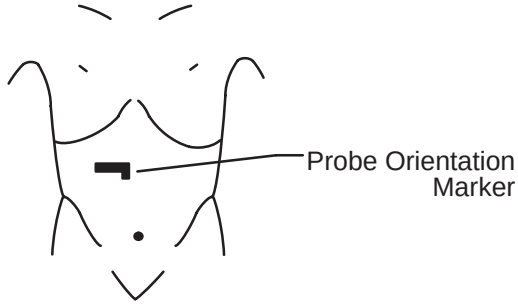


Figure 6–20. Body Pattern with Probe Marker

Names of available body patterns can be displayed in the Soft-Menu by pressing the **Body Pattern** key.

Body Pattern packages are displayed according to exam category and preset.

The 8 body pattern packages may be customized to accomodate user preference. The 16 individual body patterns in the eight packages can be changed.

Body Patterns (cont'd)

Use the sub menu arrow keys to select the desired pattern to be displayed. The Set Up/System Parameters menu page 4 allows for the choice of displaying the pattern only during freeze or at all times.

Each Body Pattern Package (1–8) can be customized and the package for each preset selected in the Set Up/System Parameters menus.

The Body Pattern Package (1–8) is selected from the Set Up/Preset Program page 1.

Figure 6–21 shows the body patterns available to be preset and the order in which they appear in the selection cycle.

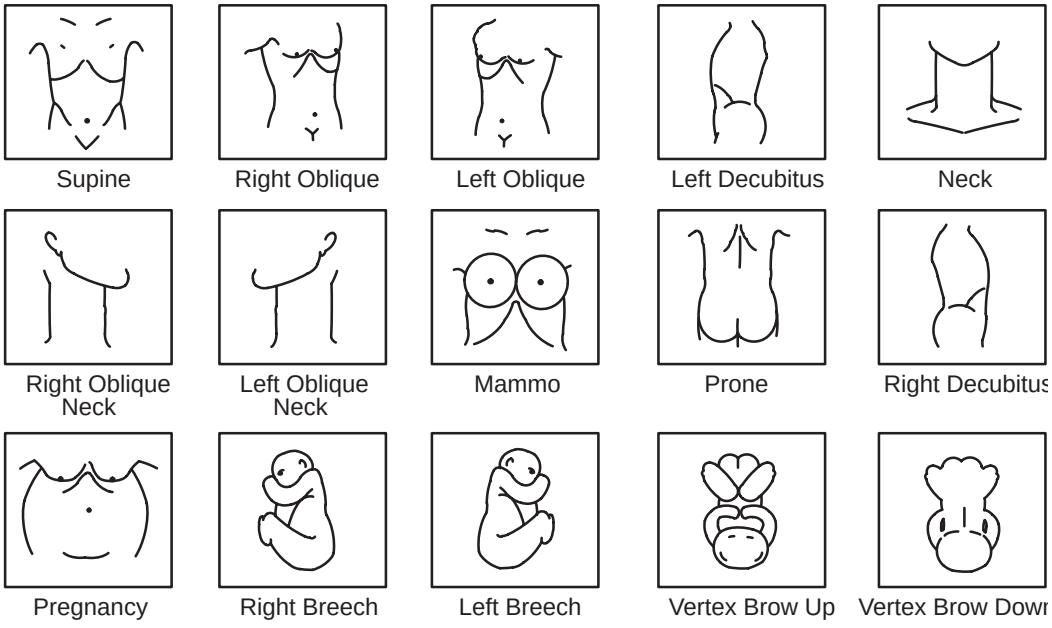


Figure 6–21. Body Patterns

Body Patterns (cont'd)

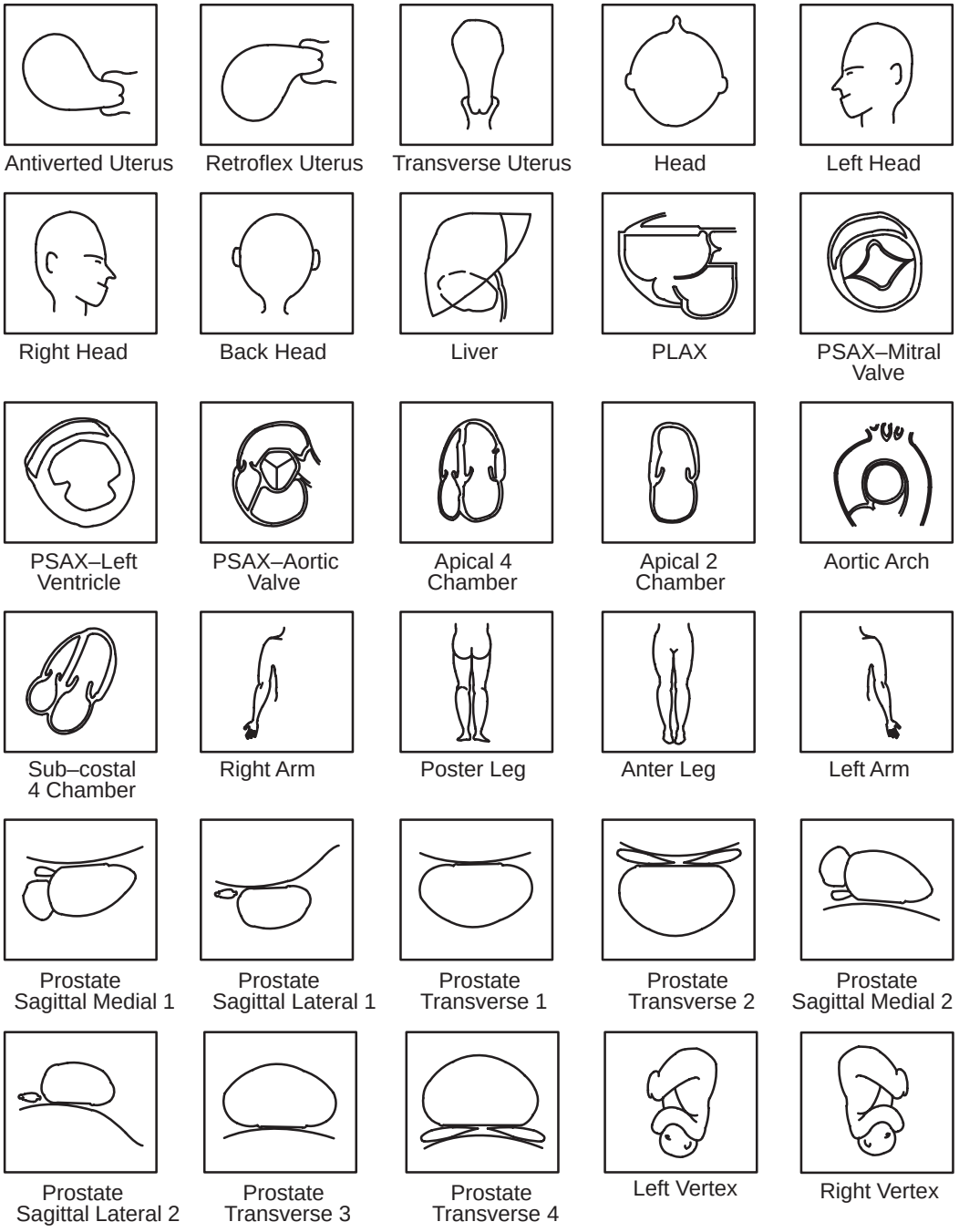


Figure 6–21. Body Patterns (cont'd)

Body Patterns (cont'd)

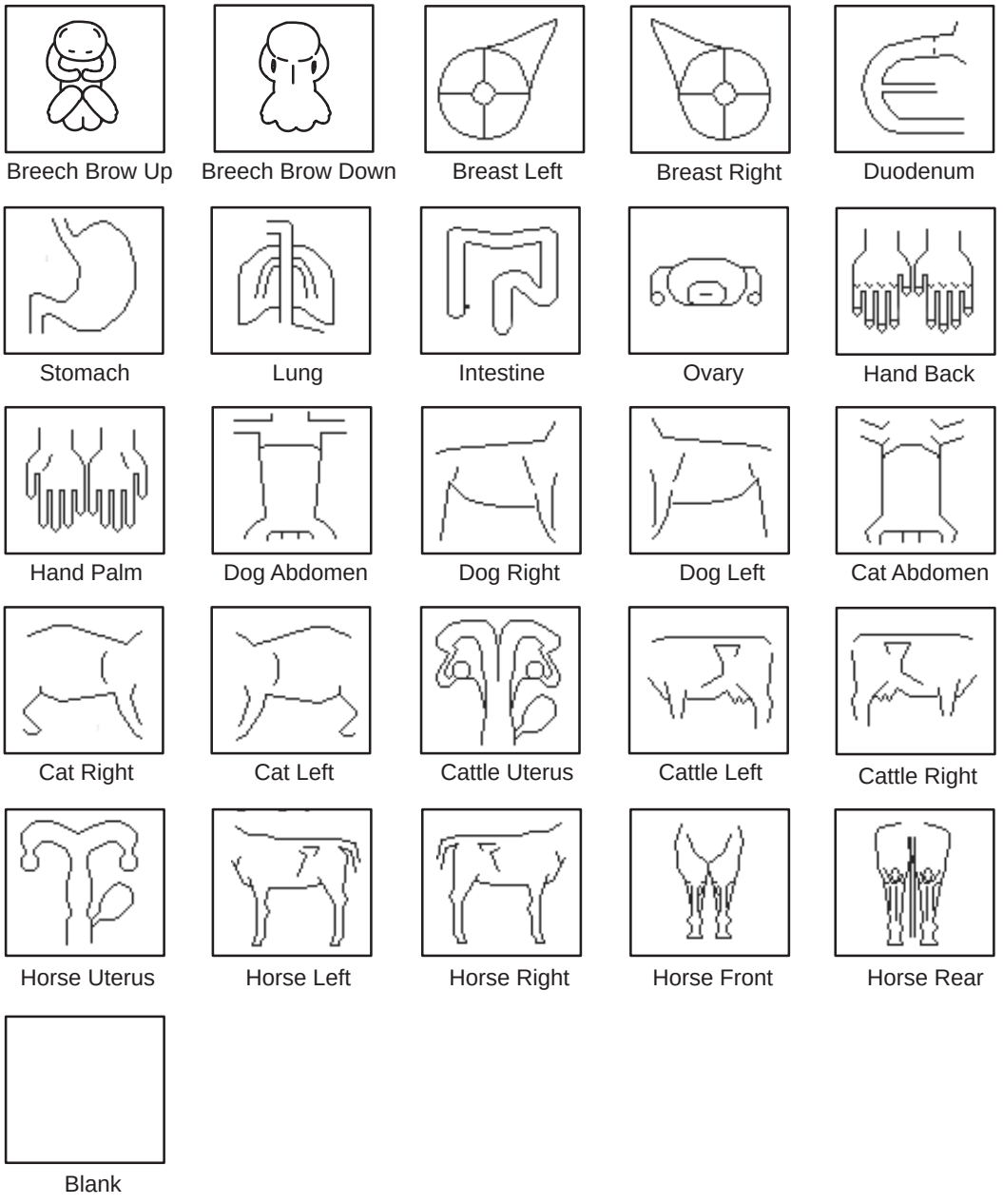


Figure 6–21. Body Patterns (cont'd)

NOTE: Refer to 14–65 for details on selecting the body pattern package to be used.

Introduction

Overview

Measurements and calculations derived from ultrasound images are intended to supplement other clinical procedures available to the attending physician. The accuracy of measurements is not only determined by system accuracy, but also by the use of proper medical protocols by the user. When appropriate, be sure to note any protocols associated with a particular measurement or calculation. Formulas and databases used within the system software that are associated with specific investigators are so noted. Be sure to refer to the original article describing the investigator's recommended clinical procedures.

Measurements can be made in all modes and image formats, including real-time, freeze, CINE or VCR playback. The selected exam category defines the default calculations displayed on the Soft Menu.

Measurement values update on the display until the measurement has been completed. 18 lines of measurements can be displayed on the screen at one time.

The measurement cursor is not automatically fixed when the **Record** key is pressed. Record all desired measurements displayed on the screen before erasing them.

NOTE: If the Doppler option is not installed with the LOGIQ™ 400 Black/White systems, the Doppler Mode measurements cannot be performed.

Measurement Controls

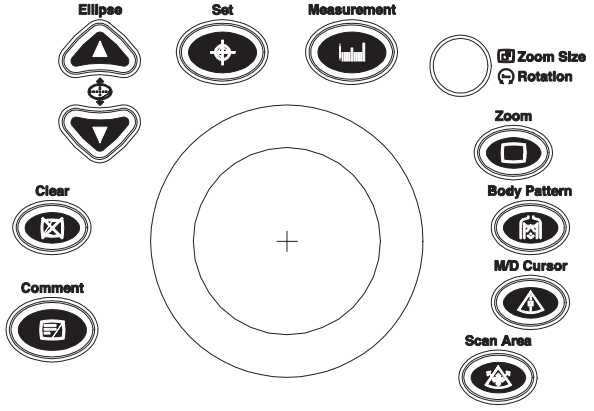


Figure 7–1. Locating Measurement Controls

Measurement — The Measurement key is used to enable all types of basic measurements. It displays the measurement and calculation soft menu for the current exam category.

Ellipse — The Ellipse arrow keys are used to activate the ellipse measurement function after the first distance measurement has been set. They also toggle which cursor is the movable cursor during the ellipse adjustment.

Trackball — Used to move the measurement cursors.

Set — Fixes the cursor for measurements or completes the measurement sequence.

Clear — Erases measuring cursor and measurement data from the display during a measurement sequence. Clears all cursors and measurements from the display when not performing a measurement sequence.

Cursors

During the measurement process, the fixed and active cursors can either be an “X” or “+” symbol. The *“Active Measurement Cursor”* preset, located on System Parameters page 3, allows for the choice of the Measurement cursor.

Once the measurement sequence is complete, the cursor symbol changes to one of the eight shown below.

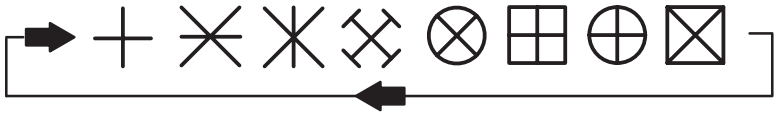


Figure 7–2. Measurement Completed Cursors

General Mode Measurements Method

When performing measurements, it is possible to choose the display of and location of the caliper for subsequent measurements while in B, M or Doppler modes. These presets (*“B Auto Caliper Control”*, *“M Auto Caliper Control”* and *“D Auto Caliper Control”*) are located on Preset Program page 4.

Measurement Key

The following table indicates the types of generic measurements available when the **Measurement** key is pressed and no specific calculation is chosen. The type of measurement depends on the current scan mode and the number of times the **Measurement** key is pressed.

Key Pressed (while frozen)	**MODE**			
	B	**Spectral Doppler (with B)**	**M (with B)**	**CFM (with B)**
Once	Distance Ellipse/Circle	Peak Velocity	Tissue Depth (Distance)	Distance Ellipse/Circle
Twice	Trace/Circle	TAMAX/TAMIN/ TAMEAN/TAMODE	Time Interval	Trace/Circle
Three Times	Gray Scale Echo Level	2 Velocities Slope/Time Interval	Depth Difference Slope/Time Interval	Point Velocity
Four Times	Arrow Mark *	Time Interval	Arrow Mark *	Gray Scale Echo Level
Five Times		Arrow Mark *		Arrow Mark *

* Assuming the “Arrow Mark Display” preset is set to *On*.

Table 7–1. General Measurements by Mode

The “Arrow Mark Display” preset, found on Preset Program page 4, allows the display of an arrow mark when the Measurement key is pressed a certain number of times.

General Instructions

Prior to making measurements, **Freeze** should be pressed to stop the acquisition of the image data.

For some types of measurements, press the **Measurement** key to toggle between active cursors for fine adjustment prior to completing the measurements.

Pressing **Clear** prior to completing the measurement sequence erases the active measuring marker and the current data measured.

Pressing **Clear** after the sequence is complete erases all data that has been measured to this point, but not data entered on to report pages.

Any measurement can be repeated by selecting that measurement again from the Sub-Menu.

Erasing Measurements

The following actions erase measurements from the system's memory:

- Rotating the **Cine Scroll** knob erases measurements.
- Pressing **New Patient** erases all measurements and calculations on the display and clears the report pages.
- Unfreezing the image erases measurements from the display only, not from the report pages.
- Adding a new measurement that exceeds the maximum number of allowable measurements erases the first or oldest measurement.
- Pressing **Clear** erases all completed measurements and calculations on the display. Measurements and calculations, however, remain on the report pages.

"Measurement Clear Operation" is a parameter found in the Set Up/Preset Program page 3. This parameter can be set to have only measurements erased with the **Clear** key or measurements and comments.

Mode Measurements

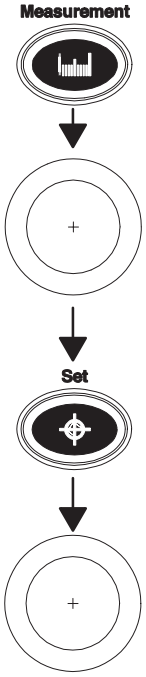
B-Mode Measurements

Three basic measurements can be made in B-Mode.

- Distance
- Circumference/Area (Ellipse or Trace Methods)
- Gray Scale Echo Level

Distance Measurement

Distance Measurements are typically made in the B-Mode portion of the image. To make a distance measurement:



Press the **Measurement** key once to display a "×" cursor.

Use the **Trackball** to move the "×" cursor to the measurement start point.

Press **Set** to fix the measurement start point and display a second "×" cursor.

Use the **Trackball** to move the second "×" cursor to the measurement end point.

Distance Measurement (cont'd)

Hints

Press **Measurement** to toggle between which cursor is activate.

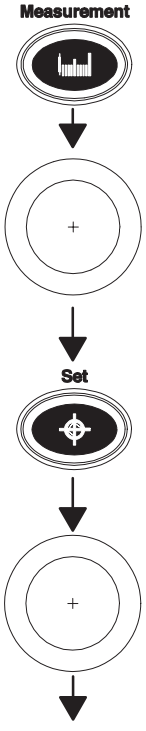
Press **Clear** once to erase the second measuring marker and the current data measured and start the measurement again.

Press **Set** to complete the measurement and fix the Distance value displayed on the bottom part of the screen.

Pressing **Clear** after the sequence is complete erases all data that has been measured to this point, but not data entered on to report pages.

Circumference/Area (Ellipse) Measurement

An ellipse can also be used to measure the circumference and area of an organ. To measure with an ellipse:



Press **Measurement** to set up the measurement mode. The "×" cursor appears on the display.

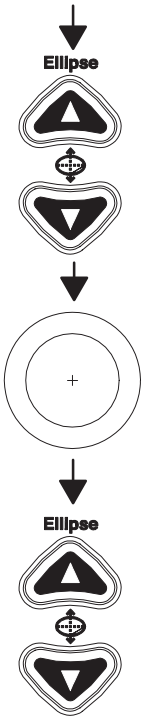
Use the **Trackball** to move the "×" cursor to either end of the major axis of the area to measure.

Press **Set** to fix the start point cursor.

Use the **Trackball** to move the second cursor to the major axis measurement end point.

(continued)

Circumference/Area (Ellipse) Measurement (cont'd)



Press the **Ellipse** up arrow key. An ellipse having an initial circle shape appears.

Use the **Trackball** to position the ellipse, as necessary, and to size the measured axis.

Press the **Ellipse** up arrow key to increase the size of the minor axis.

Press the **Ellipse** down arrow key to decrease the size of the minor axis.

Hints

Press **Measurement** to toggle between which cursor is activate.

Press **Clear** once to erase the ellipse and the current data measured. The original cursor is displayed to restart the measurement.

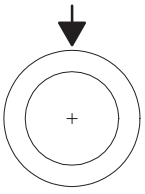
Press **Set** to complete the ellipse measurement and display the circumference and area.

Pressing **Clear** a second time exits the measurement function without completing the measurement.

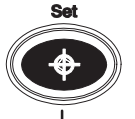
Circumference/Area (Trace) Measurement

To trace the circumference of a portion of the anatomy and calculate its area:

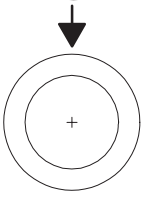
Press **Measurement** twice to display a dot "⊙" cursor on the screen. The display on the bottom of the screen shows the circumference in cm.



Use the **Trackball** to move the dot "⊙" cursor to the measurement start point.



Press **Set** to change the dot "⊙" cursor to a "×" cursor.



Use the **Trackball** to trace the measurement area. The circumference displayed on the bottom of the screen will change with the tracing.

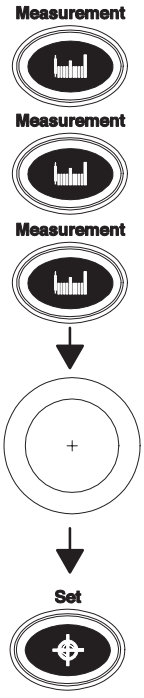
*NOTE: Press **Clear** to erase the measuring marker and the current data measured and redo the measurement.*

Press **Set** to fix the Circumference value displayed on the bottom of the screen and calculate the area.

*NOTE: When using the trace method, the **Zoom Size/Rotation** knob can be used to edit the trace line. Turn it clockwise or counterclockwise to erase the line (bit by bit) back from its current point. This erase function is limited to a small portion of the most recent trace.*

Echo Level Measurement

To make an echo level measurement:



Press **Measurement** three times to enable the echo level function. A box "□" cursor appears.

Use the **Trackball** to move the box "□" cursor over the measurement area.

Press **Set** to fix the Echo value displayed.

Hints

- The size of the box cursor can be changed by using the Set Up/Preset Program menu page 3.
- The box is actual size and will appear to get larger or smaller with changes in depth (scale).
- The echo level measurement is only available on a frozen image, not on a B-paused image.

CFM B-Mode Measurements

While in the Color Flow and B-Mode combination, 4 basic measurements can be taken.

- Distance
- Circumference/Area (Ellipse or Trace Methods)
- Gray Scale Echo Level
- Velocity Point

Distance

Distance is measured the same as B/W B-Mode. Refer to *7–7*.

Circumference/Area

Circumference and area are measured the same as in B/W B-Mode. Refer to *7–8*.

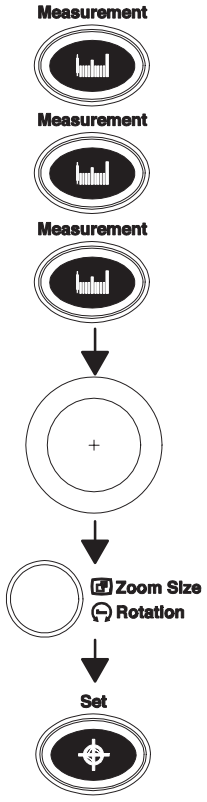
Gray Scale Echo Level

Gray scale echo level is measured the same as in B/W B-Mode. Refer to *7–11*.

Velocity point

This measurement provides an estimate of the average (or mean) velocity at one point in the CFM B-Mode display. This is achieved by calculating the numerical value equivalent to the color at the selected point in the display and adjusting it to the selected flow angle. This procedure cannot be used to determine maximum, minimum or other specific velocity estimates.

To measure the velocity at a certain point in the color display:



Press **Measurement** three times. A "×" cursor appears.

Use the **Trackball** to move the cursor to the desired portion of the display.

Use the **Zoom Size/Rotation** control to adjust to the angle of blood flow.

Press **Set** to complete the measurement and to display the velocity and angle values.

CAUTION

Potential for misdiagnosis. The CFM B-Mode velocity point measurement only provides an average velocity estimate and should not be used as a substitute for PW Doppler velocity measurement. Use PW Doppler Mode to obtain measurements from specific portions of the Doppler spectrum.

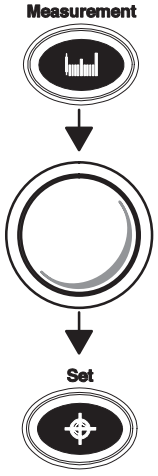
Doppler Mode Measurements

4 basic measurements can be made in Doppler Mode or the Doppler Spectrum portion of the display.

- Peak Velocity
- TAMAX/TAMIN/TAMEAN/TAMODE (Manual or Auto Trace)
- Two Velocities with the Slope and Time Interval between them.
- Time Interval

Peak Velocity

To measure peak velocity:



Press **Measurement**. The "×" cursor with a vertical dotted line appears.

Use the **Trackball** to move the cursor to the desired point of measurement in the Doppler Spectrum.

Press **Set** to fix the velocity cursor. The velocity measurement in m/s or cm/s will be displayed at the bottom of the screen.

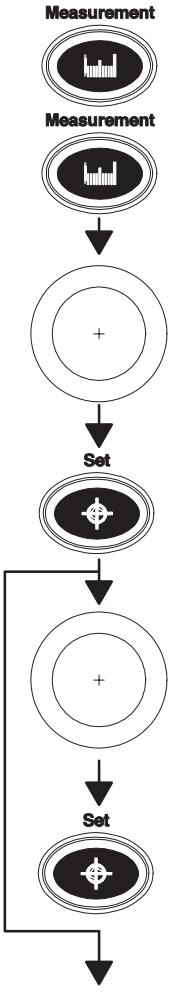
The *"Velocity Unit"* preset, located on Preset Program page 3, allows the unit of display for all velocity measurements to be selected.

The *"Display MaxPG with Velocity"* preset, located on Preset Program page 4, allows MaxPG to be displayed with the Peak Velocity measurement.

TAMAX/TAMIN/TAMEAN/TAMODE (Manual or Auto Trace)

The value measured depends upon “D Realtime Trace Method” selection in the Set Up/Custom Display page 13. The 4 selections available are: Peak (TAMAX), Floor (TAMIN), Mean (TAMEAN) and Mode (TAMODE).

To trace TAMAX/TAMIN/TAMEAN/TAMODE:



Press **Measurement** twice. A dot “⊙” cursor appears if the default method is manual. A “×” cursor with a vertical dotted line appears if the trace default method is auto.

Use the **Trackball** to move the cursor to the trace start point in the Doppler spectrum.

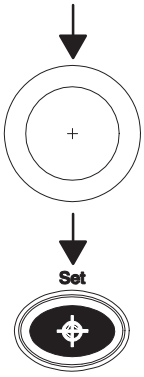
Press **Set** to fix the start point.

If D Realtime Auto Trace (on or calc) is the default method or Trace Auto is on, use the **Trackball** to position the vertical cursor at the second value (end point).

Press **Set**. The system automatically fixes both cursors and traces the maximum value between the two points. That value is displayed at the bottom of the screen.

(continued)

TAMAX/TAMIN/TAMEAN/TAMODE (Manual or Auto Trace) (cont'd)



If D Realtime Auto Trace (off) is the default method, use the **Trackball** to trace the maximum values of the desired portion of the spectrum.

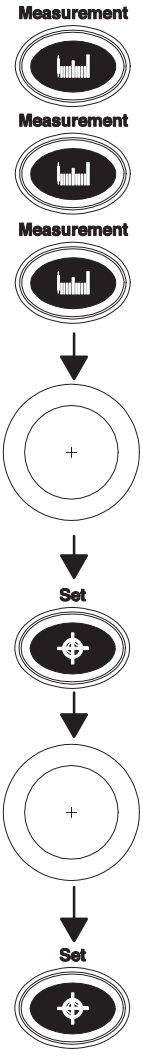
Press **Set** to complete the measurement.

*NOTE: When using the manual trace method, the **Zoom Size/Rotation** knob can be used to edit the trace line.*

Turn it clockwise or counterclockwise to erase the line (bit by bit) back from its current point. This erase function is limited to a small portion of the most recent trace.

Slope/Time Interval

Two velocity values, the time interval (sec) and slope (m/s^2) can be measured by:



Press **Measurement** three times. A "×" cursor with vertical dotted lines appears.

Use the **Trackball** to move the cursor to the measurement start point.

Press **Set** to fix the start point.

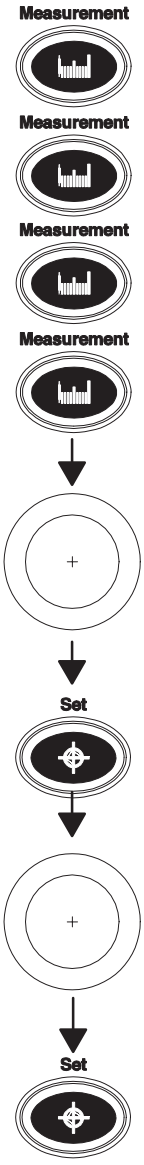
Use the **Trackball** to move the end cursor to the measurement end point.

Press **Set** to complete the measurement.

The two peak end point velocities, time interval and slope are displayed.

Time Interval

To measure a horizontal time interval:



Press **Measurement** four times. A "×" cursor with a vertical dotted line appears when the cursor is in the Doppler spectrum portion of the display.

Use the **Trackball** to move the cursor to the measurement start point.

Press **Set** to fix the first cursor.

Use the **Trackball** to move the end cursor to the measurement end point.

Press **Set** to complete the measurement.

The time interval between the two cursors is displayed at the bottom of the screen.

Realtime Doppler Calculations (option)

The ultrasound system has the ability to automatically measure, calculate and display specific parameters using the Doppler Auto Trace in realtime. This applies to all exam categories except GYN and Cardiology with AMCAL option. Refer to the *Advanced Options chapter of the Advanced Reference Manual* for further details.

M-Mode Measurements

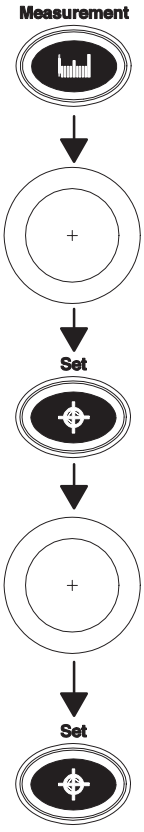
Basic measurements that can be taken in the M-Mode portion of the display are:

- Tissue Depth (Distance)
- Time Interval
- Depth Difference with Time Interval and Slope

Tissue depth

Tissue depth measurement in M-Mode functions the same as the distance measurement in B-Mode. It measures only vertical distance between points.

Scan patient with M-Mode timeline displayed.



Press **Measurement** once. A "×" cursor with a vertical dotted line appears.

Use the **Trackball** to move the "×" cursor to the most anterior point to be measured.

Press **Set** to fix the start point.

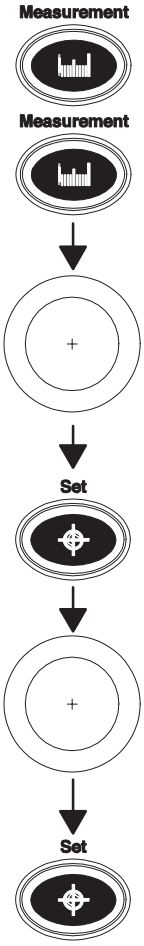
Use the **Trackball** to move the second point to the most posterior point to be measured.

Press **Set** to complete the measurement.

The vertical distance between the two points is displayed at the bottom of the screen.

Time Interval

To measure a horizontal time interval:



Press **Measurement** twice. A "×" cursor with a vertical dotted line appears when the cursor is in the M-Mode portion of the display.

Use the **Trackball** to move the cursor to the measurement start point.

Press **Set** to fix the first cursor.

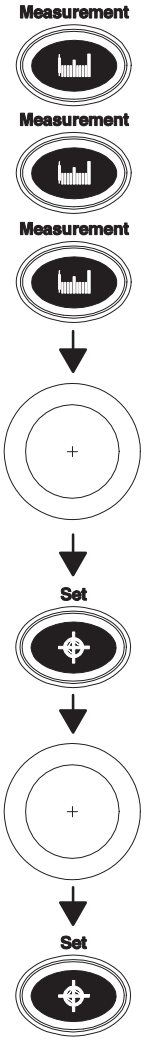
Use the **Trackball** to move the end cursor to the measurement end point.

Press **Set** to complete the measurement.

The time interval between the 2 cursors is displayed at the bottom of the screen.

Depth Difference with Time and Slope

To measure depth difference:



Press **Measurement** 3 times. With the cursor in the M-Mode timeline area, a "×" cursor with a vertical dotted line is displayed.

Use the **Trackball** to position the measurement start point.

Press **Set** to fix the start point.

Use the **Trackball** to position the measurement end point.

Press **Set** to complete the measurement.

The depth difference, time interval and slope between the 2 end points is displayed at the bottom of the screen.

General Calculations

Overview

NOTE: If the Doppler option is not installed with the LOGIQ™ 400 Black/White systems, the Doppler Mode measurements cannot be performed.

The General Calculations Sub-Menu can be invoked from the Rad/Abdomen exam category. The calculations available are:

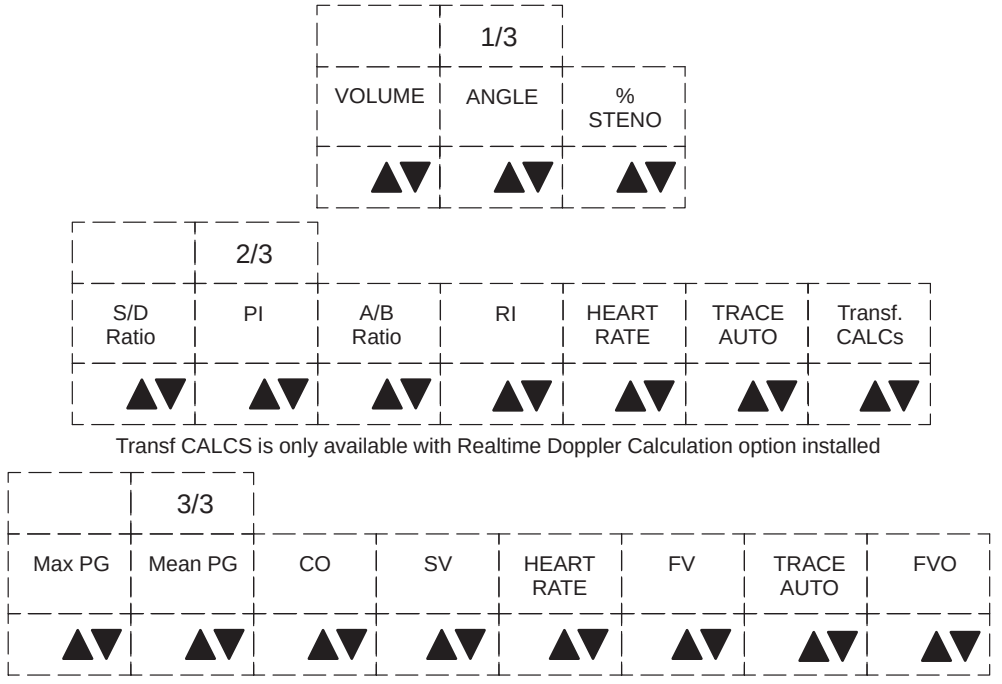


Figure 8–1. General Calculations Sub-Menus

Volume

Refer to the procedure found on *10–19*.

Angle

Refer to the procedure found on *10–22*.

Stenosis Ratio (% stenosis)

Refer to the procedure found on *10–23*.

S/D Ratio, RI, A/B Ratio or PI

Refer to the procedure found on *10–29*.

Heart Rate

Refer to the procedure found on *10–30*.

Trace Auto

Use the Trace Auto Sub-Menu selection to turn on/off the Doppler Auto Trace function. See *10–28* for more details.

Max PG

Refer to the procedure found on *10–26*.

Mean PG

Refer to the procedure found on *10–27*.

Cardiac Output (CO)

To measure CO (Cardiac Output), a velocity measurement is taken in the Doppler Spectrum. An FCA (Flow Cross Sectional Area) is measured on the vessel in B-Mode. These two measurements are used to calculate SV (Stroke Volume). Finally, a HR (Heart Rate) measurement is taken in the Doppler Spectrum. SV and HR are then used to calculate cardiac output.

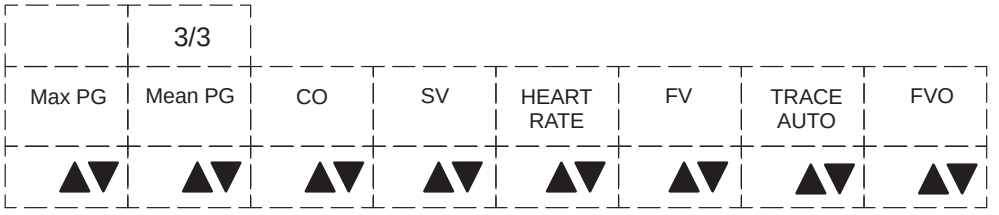


Figure 8–2. General Calculations Sub-Menu (CO)

Select **CO** from the Calculation Sub-Menu. The trace cursor (horizontal dotted line) appears in the Doppler spectrum.

See Stroke Volume Ratio on *8–5* for a step-by-step procedure on SV. After the stroke volume measurements have been completed, a vertical line cursor appears in the Doppler spectrum. Measure the Heart Rate. Refer to the procedure found on *10–30*.

CO (Cardiac Output) is computed from the SV and HR values and is displayed.

Automatic CO calculation

If the following measurements have previously been made in any order, CO (Cardiac Output) automatically calculates when it is selected from the Calculation Sub-Menu:

- Velocity in Doppler Mode
- Functional Cross Sectional Area in B-Mode (Circumference/Area)
- Heart Rate in Doppler Mode

Stroke Volume Ratio (SV)

To measure stroke volume, a velocity measurement is taken in the Doppler spectrum. An FCA (Flow Cross Sectional Area) is measured on the vessel in B-Mode. The velocity and FCA values are then used to calculate SV (Stroke Volume).

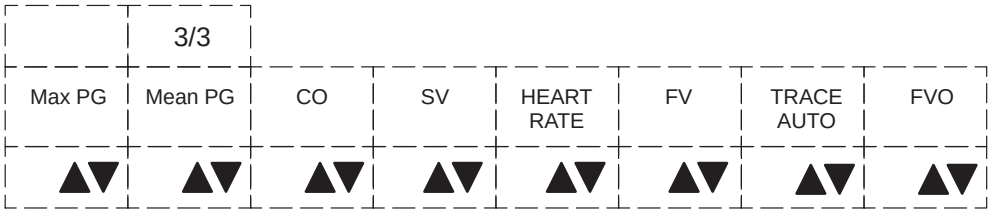
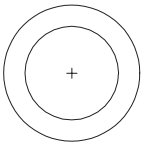
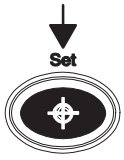


Figure 8–3. General Calculations Sub-Menu (SV)

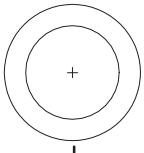
Select **SV** from the Calculation Sub-Menu. The trace cursor (horizontal dotted line) appears in the Doppler spectrum.



Move the cursor to the measurement start point dependent on the trace method chosen (peak, floor, mean or mode).

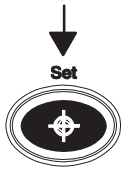


Press **Set**. The first cursor is fixed and a second is active.



If Trace Auto is enabled, use the **Trackball** to move the second cursor to the velocity measurement end point.

Press **Set**. The waveform maximum velocities are automatically traced and a velocity value is displayed.

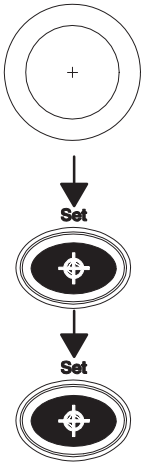


If Trace Auto is disabled, use the **Trackball** to trace the waveform.

Press **Set**. The trace waveform is fixed and the velocity value is displayed.

(continued)

Stroke Volume Ratio (SV) (cont'd)



A cross-point cursor appears in the B-Mode image to measure FCA (Flow Cross Sectional Area).

Use the **Trackball** to move the cursor to a point on the vessel wall.

Press **Set** to fix the start point cursor. Use the Ellipse or Trace method to measure the circumference and area of the vessel as described on *7–8* or *7–10*, respectively.

Press **Set** to complete the circumference/area measurement. The FCA is displayed.

The SV (Stroke Volume) is also computed and displayed from velocity and FCA values.

Automatic SV calculation

If velocity was previously measured while in Doppler Mode and the cross sectional area of a vessel was measured while in B-Mode, stroke volume will be automatically calculated from these previously measured values when SV is selected from the General Calculation Sub-Menu.

Heart Rate (HR)

Refer to the procedure found on *10–30*.

Flow Volume (FV)

Flow Volume estimates the volume of blood that flows through a vessel per unit time. It is derived from a vessel's cross-sectional diameter obtained from the B-Mode portion of the image and the mean velocity of flow in the vessel obtained from the Doppler portion of the image. It is measured in milliliters. When the FV measurement is made, FVO is automatically calculated.

To measure flow volume:

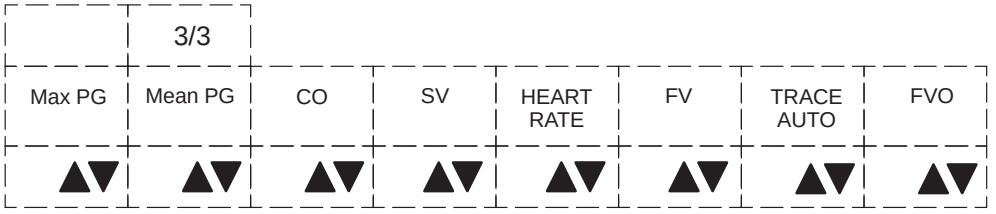


Figure 8–4. General Calculations Sub Menu (FV)

Select **FV** from the Calculation Sub Menu. Place the dotted horizontal line cursor at each of the timebase on the Doppler spectrum.

If Trace Auto is selected, the waveform is automatically traced.

If Trace Auto is not selected, manually trace the desired portion of the waveform.

The cursor moves to the B-Mode area.

Use the Ellipse or Trace method to measure the circumference and area of the vessel as described on *7–8* or *7–10*, respectively.

The flow volume (FV) is calculated and displayed in milliliters. The flow volume output (FVO) is also calculated and displayed in milliliters/minute.

Trace Auto

Use the Trace Auto Sub-Menu selection to turn on/off the Doppler Auto Trace function. See *10–28* for more details.

Flow Volume Output (FVO)

This measurement is used to measure the flow volume output in a vessel on the Doppler spectrum. It is measured in milliliters/minute. When the FVO measurement is made, FV is automatically calculated.

Refer to the FV measurement on *8–7* for details.

Helpful hints

Hints

The following hints can help when taking a measurement:

- If **PRINT** is pressed while making a measurement, the system completes the measurement and sends the data to the report page (unless the VCR is assigned to the **PRINT** key).
- Prior to making measurements, use the Cine function, if necessary, to display the best image.
- Measurements can continue to be made until all measurement/calculation cells are filled. The cells are displayed at the bottom center of the display.
- Once all measurement/calculation cells are filled on the display, any further measurements will cause the top (first) cell to be erased and the new measurement added last (“first in, first out”).
- If there is a series of measurements/calculations that are routinely taken in a specific sequence, the auto sequence feature of the system can be used to program these measurements/calculations to automatically appear on the display in the desired order. Refer to *14–79* for details on programming an auto sequence.

Hip Dysplasia Measurement

A HIP Dysplasia measurement is available. The HIP calculation assists in assessing the development of the infant hip. In this calculation three straight lines are superimposed on the image and aligned with the anatomical features. The 2 angles are computed, displayed and can be used by the physician in making a diagnosis.

The three lines are (Source: R GRAF, journal of Pediatric Orthopedics, 4: 735–740(1984)).

1. The inclination line connects the osseous convexity to labrum acetabulare.
2. The Acetabulum roof line connects the lower edge of the osilium to the osseous convexity.
3. The Baseline connects the osseous acetabulum convexity to the point where the joint capsule and the perichondrium unite with the iliac bone.

The Angle α (Alpha) is the supplement of the angle between 1 and 3. It characterizes the osseous convexity. The angle β (Beta) is the angle between lines 1 and 2. It characterizes the bone supplementing additional roofing by the cartilaginous convexity.

NOTE: There are two methods (Cranial–left and Caudal–left) for the Hip Dysplasia Measurement Orientation. This preset, "Hip Orientation", is located on Preset Program page 4.

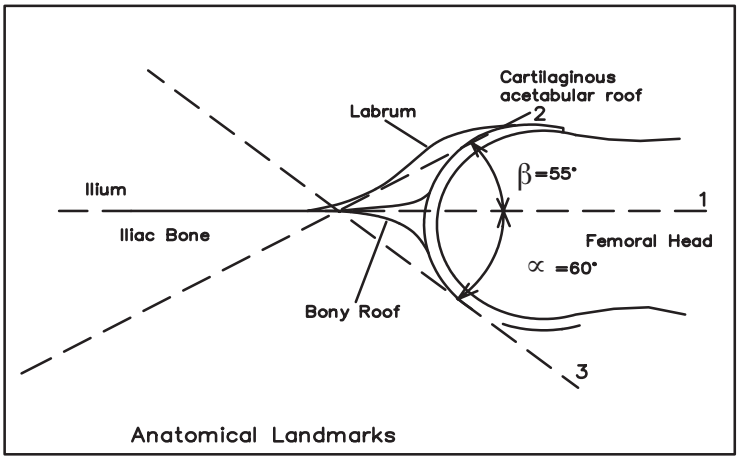


Figure 3–26. Hip Dysplasia

HIP Dysplasia Measurement (cont'd)

To activate the Hip Dysplasia Measurement:

1. To add the HIP Measurement, select *"Measurement Menu B"* in Preset Program page 7. If necessary, select NEXT CALC until HIP DYSPLASIA is displayed. Select HIP DYSPLASIA.
2. Press **Measurement**. Select the HIP measurement on B-Mode Measurement soft-menu. The system prompts the user in the measurement process.
3. To set the 3 lines for the Hip measurement, use the **Trackball**, **Zoom Size/Rotation** knob and **Set** key. The hip measurements (α and β) are displayed on the bottom of the screen.

General Calculation Formulas

Calc Mnemonic	Calc Name	Input Measurements	Formula
MaxPG	Maximum Pressure Gradient	two Doppler blood flow peak velocities	MaxPG[mmHg]=4x(v1^2–v2^2)
MeanPG	Mean Pressure Gradient	flow velocities from one time marker to another time marker in a Doppler display	MeanPG[mmHg]= $4x \sum_{i=1}^{n} (Vi^2)/n$
SV	Stroke Volume	flow velocities from one time marker to another time marker in a Doppler display and one area	SV[ml]= (sum{V_{t^2}} from t1 to t2)x a1
CO	Cardiac Output	two distances and one 2 beat time interval	CO[1/min]= SVxHR/1000
FV	Flow Volume	flow velocities from one time marker to another time marker in a Doppler display and one area	FV [ml] = (sum{Vt[m/s]} from t1 to t2) x a1[cm^2]
FVO	Flow Volume Output	flow velocities from one time marker to another time marker in a Doppler display and one area	FVO [ml/min] = FV [ml] / (t2–t1) x 60000
% Stenosis	Stenosis Ratio	two areas (by ellipse, trace, circle or distance)	% Stenosis= [1–($A_{residual}$/ A_{lumen})]x100
PI	Pulsatility Index	two Doppler blood flow peak velocities and TAMAX	PI=(V_{max}–$V_{diastole}$)/TAMAX **NOTE**
RI	Resistivity Index	two Doppler blood flow peak velocities	RI=(V_{max}–$V_{diastole}$)/V_{max} **NOTE**
HR	Heart Rate (beats/minute)	one 2 beat time interval	HR[BPM]=120[sec]/ 2beat time [sec]
A/B Ratio	Velocities Ratio	two Doppler blood flow peak velocities	A/B=V_1/V_2
TAMAX	Time Averaged Maximum Velocity (Trace Method is Peak or manual)	two time marks in a Doppler display	TAMAX=sum{V_t} from t1 to t2/(t2–t1) [cm/s or m/s]
TAMIN	Time Averaged Minimum Velocity (Trace method is Floor)	two time marks in a Doppler display	TAMIN=sum{V_t} from t1 to t2/(t2–t1) [cm/s or m/s]
TAMEAN	Time Averaged Mean Velocity (Trace method is Mean)	two time marks in a Doppler display	TAMEAN=sum{V_t} from t1 to t2/(t2–t1) [cm/s or m/s]
TAMODE	Time Averaged Mode Velocity (Trace method is Mode)	two time marks in a Doppler display	TAMODE=sum{V_t} from t1 to t2/(t2–t1) [cm/s or m/s]

**NOTE*:* $V_{diastole} = V_{min}$ or $V_{end–diastole}$

Table 8–1. General Calculation Formulas

Exam Preparation

Overview

Prior to an ultrasound examination, the patient should be informed of the clinical indication, specific benefits, potential risks, and alternatives, if any. In addition, if the patient requests information about the exposure time and intensity, it should be provided. Patient access to educational materials regarding ultrasound is strongly encouraged to supplement the information communicated directly to the patient. Furthermore, these examinations should be conducted in a manner and take place in a setting which assures patient dignity and privacy.

- Prior material knowledge and approval of the presence of nonessential personnel with the number of such personnel kept to a minimum.
- An intent to share with the parents, either during the examination or shortly thereafter, the information derived.
- An offer of choice about viewing the fetus.
- An offer of choice about learning the sex of the fetus, if such information becomes available.

Ultrasound examinations performed solely to satisfy the family's desire to know the fetal sex, to view the fetus or to obtain a picture of the fetus should be discouraged.

Fetal Doppler

Doppler Mode for Fetal Exams

Indications for Fetal Doppler use

B/W Option

The LOGIQ™ 400 system can be used for fetal examination in Pulsed Wave Doppler, Continuous Wave Doppler, Color Flow Doppler and Color M-Mode for the diagnosis of:

- Structural fetal cardiac anomalies (18 weeks gestation to term) for high-risk patients.
- Intrauterine growth retardation (IUGR) (28 weeks gestation to term) for high-risk patients with one or more of the following known or suspected conditions:
  - Multiple pregnancy
  - Maternal hypertension
  - Hydrops
  - Diabetes
  - Lupus
  - Placenta abnormality.

Contraindications

Pulsed Wave Doppler, Continuous Wave Doppler, Color Flow Doppler and Color M-Mode are not intended for routine fetal examination or screening nor are they intended for fetal examination in a low-risk population. The use of Doppler, even at minimal output levels, in fetal examination must be adjunctive with conventional fetal echocardiography and other clinical diagnostic methods, for high risk patients only.

Acoustic Output

Considerations

General warning

CAUTION

The LOGIQ™ 400 system is a multi-use device which is capable of exceeding FDA Pre-enactment acoustic output (spatial peak-temporal average) intensity limits for fetal applications.

Prudent use

It is prudent to conduct an exam with the minimum amount and duration of acoustic output necessary to optimize the image's diagnostic value.

Concerns surrounding fetal exposure

Always be aware of the acoustic output level by observing the Acoustic Output Display. In addition, become thoroughly familiar with the Acoustic Output Display and equipment controls affecting output.

Training

It is recommended that all users receive proper training in fetal Doppler applications before performing them in a clinical setting. Please contact a local sales representative for training assistance.

OB Measurements and Formulas

Introduction

Measurements and calculations derived from ultrasound images are intended to supplement other clinical procedures available to the attending physician. The accuracy of measurements is not only determined by the system accuracy, but also by use of proper medical protocols by the user. When appropriate, be sure to note any protocols associated with a particular measurement or calculation. Formulas and databases used within the system software that are associated with specific investigators are so noted. Be sure to refer to the original article describing the investigator's recommended clinical procedures.

If obstetrics was selected as the exam category on the Patient Entry Menu, the OB Menu automatically appears in the Soft-Menu when the **Measurement** key is pressed.

NOTE: If the Doppler option is not installed with the LOGIQ™ 400 Black/White systems, the Doppler Mode measurements cannot be performed.

OB Format Selection

Four types of OB measurements and report pages can be selected from the Set Up/System Parameter Menu page 2.

The user may choose to measure and report items based on Tokyo University, Osaka University, USA or European methods.

OB Measurement Soft Menus and Formulas

The factory default measurement menus are shown in Figure 9–1 through Figure 9–4. The user should be familiar with how to do basic distance and circumference measurements, as described in the General Measurements and Calculations chapter.

Tokyo University Method

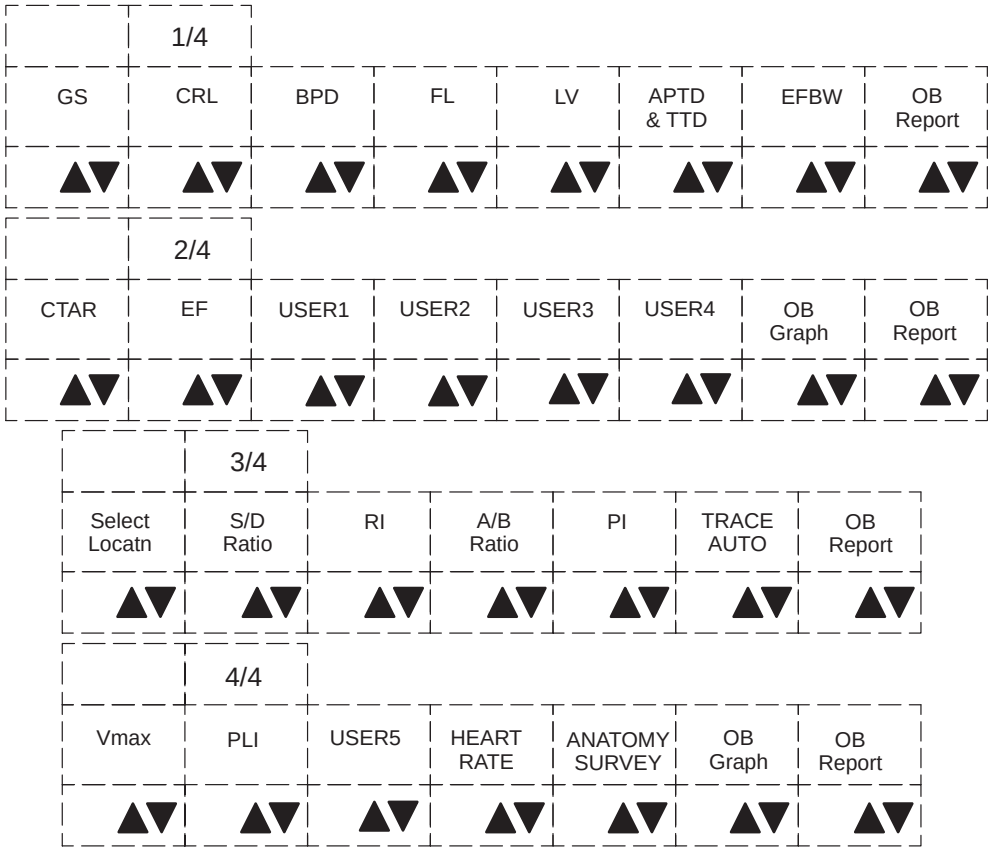


Figure 9–1. Tokyo University Sub-Menus

NOTE: Tokyo EFBW selection is made in the Set Up/System Parameters menu page 2.

Tokyo University Method (cont'd)

Calc Mnemonic	Calc Name	Input Measurements	Formula	Author Reference
HR	Heart Rate (beats/minute)	one 2 beat time (measured manually or automatically)	HR[BPM]= 120[sec]/ 2beat time[sec]	n/a
GS	Gestational Sac	one distance	Curve data is available in the Advanced Reference Manual	Tokyo University Method 1986, 6 by Univ. of Tokyo
CRL	Crown Rump Length	one distance		
FL	Femur Length	one distance		
BPD	Biparietal Diameter	one distance		
LV	Length of Vertebra	one distance		
APTD	Antero posterior Trunk Diameter	one distance	APTD = input	
TTD	Transverse Trunk Diameter	one distance	TTD = input	
EFBW	Estimated Fetal Body Weight	Average of BPD, Average of APTD, Average of TTD and Average of FL	EFBW = 1.07 x BPD^ 3 +3.42 x APTD x TTD x FL	
CTAR	Cardio–Thoracic Area Ratio	four distances or two areas	CTAR = (d1 x d2) / (d3 x d4) x 100 or a1 / a2 x 100	Y.Chiba Fetal Diagn Ther 1990 : 5 : 175 – 188
PLI	Preload Index	two Doppler blood flow velocities	PLI = | v1 / v2 |	Y.Chiba Fetal Diagn Ther 1990 : 5 : 168 – 174
EF	Ejection Fraction	two distances on M-Mode (End-diastolic dimension and End-systolic dimension on M-Mode)	EF = (1 – Ds^3 / Dd^3)	n/a
Vmax	Maximum Velocity in descending aorta	one Doppler blood flow peak velocities	Vmax = input	n/a
S/D Ratio	Systolic / Diastolic Ratio	two Doppler blood flow peak velocities	S/D = Vsystole / Vdiastole **NOTE**	n/a
A/B Ratio	Velocities Ratio	two Doppler blood flow peak velocities	A/B = V_1/V_2	n/a
PI	Pulsatility Index	two Doppler blood flow peak velocities and TA_MAX	PI = (Vmax – $V_{diastole}$)/ TA_MAX **NOTE**	n/a
RI	Resistivity Index	two Doppler blood flow peak velocities	RI = (Vmax – $V_{diastole}$)/ Vmax **NOTE**	n/a

NOTE: $V_{diastole} = V_{min}$ or $V_{end–diastole}$

Table 9–1. OB Calculation Formulas—Tokyo University Factory Defaults

Osaka University Method

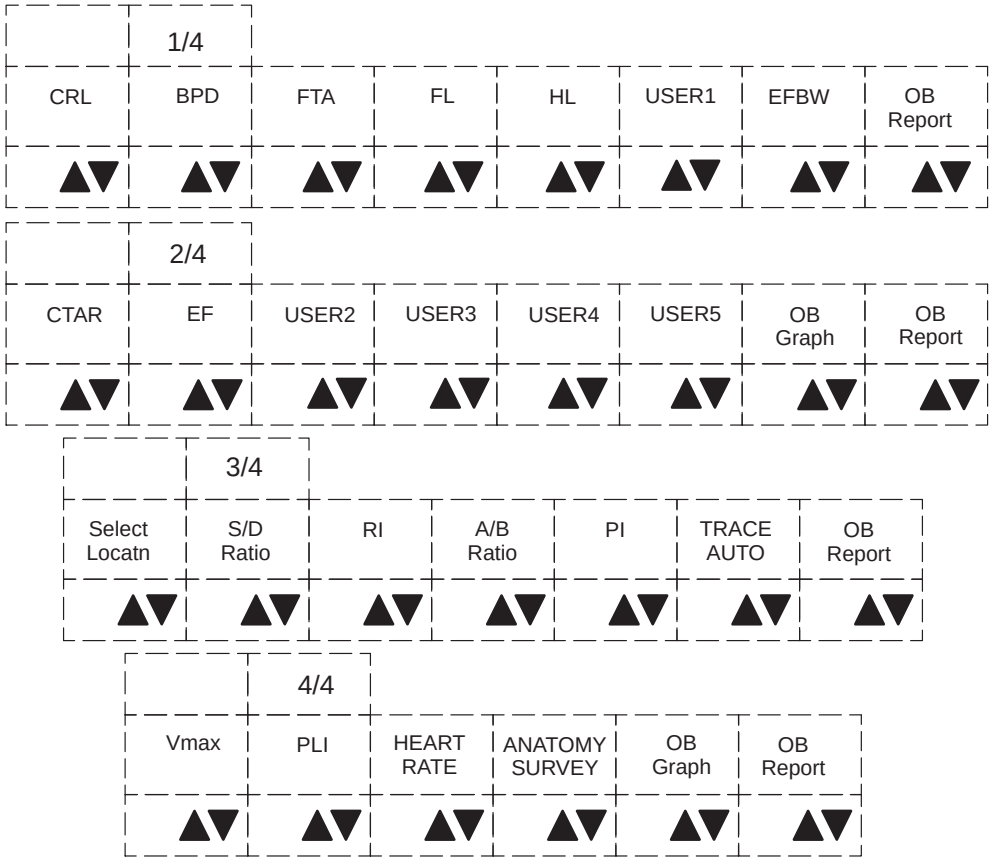


Figure 9–2. Osaka University Sub-Menus

Osaka University Method (cont'd)

Calc Mnemonic	Calc Name	Input Measurements	Formula	Author Reference
HR	Heart Rate (beats/minute)	one 2 beat time (measured manually or automatically)	HR[BPM]=120[sec]/ 2beat time[sec]	n/a
CRL	Crown Rump Length	one distance	Curve data is available in the Advanced Reference Manual	Osaka University Method 1989, 3 by Univ. of Osaka
FL	Femur Length	one distance		
BPD	Biparietal Diameter	one distance		
HL	Humerus Length	one distance		
FTA	Fetal Trunk Cross Sectional Area	one area	APTD = input	
EFBW	Estimated Fetal Body Weight	Average of BPD, Average of FTA and Average of FL	EFBW=1.25647x BPD^3+3.50655 x FTA x FL+6.3 (<5000g) IUGR=1.229 x BPD^3+3.063 x FTA x FL–24.6 Curve data is available in the Advanced Reference Manual	
CTAR	Cardio–Thoracic Area Ratio	four distances or two areas	CTAR = (d1 x d2) / (d3 x d4) x 100 or a1 / a2 x 100	Y.Chiba Fetal Diagn Ther 1990 : 5 : 175 – 188
PLI	Preload Index	two Doppler blood flow velocities	PLI = | v1 / v2 |	Y.Chiba Fetal Diagn Ther 1990 : 5 : 168 – 174
EF	Ejection Fraction	two distances on M–Mode (End–diastolic dimension and End–systolic dimension on M–Mode)	EF = (1 – Ds^3 / Dd^3)	n/a
Vmax	Maximum Velocity in descending aorta	one Doppler blood flow peak velocities	Vmax = input	n/a
S/D Ratio	Systolic / Diastolic Ratio	two Doppler blood flow peak velocities	S/D = Vsystole / Vdiastole **NOTE**	n/a
A/B Ratio	Velocities Ratio	two Doppler blood flow peak velocities	A/B = V_1/V_2	n/a
PI	Pulsatility Index	two Doppler blood flow peak velocities and TA_MAX	PI = (Vmax – $V_{diastole}$) / TA_MAX **NOTE**	n/a
RI	Resistivity Index	two Doppler blood flow peak velocities	RI = (Vmax – $V_{diastole}$) / Vmax **NOTE**	n/a

**NOTE*:* $V_{diastole} = V_{min}$ or $V_{end–diastole}$

Table 9–2. OB Calculation Formulas—Osaka University Factory Defaults

USA Method

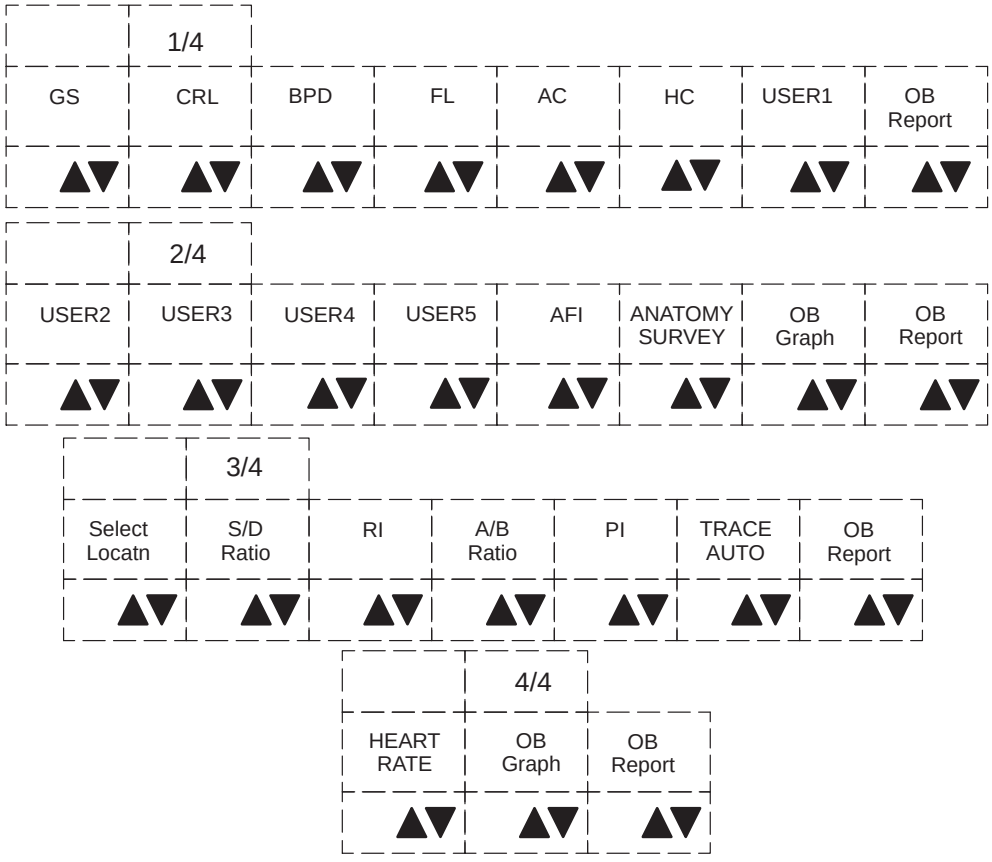


Figure 9–3. USA Sub-Menus

USA Method (cont'd)

Calc Mnemonic	Calc Name	Input Measurements	Formula	Author Reference
HR	Heart Rate (beats/minute)	one 2 beat time (Measured manually or automatically)	HR[BPM]= 120[sec]/2 beat time[sec]	n/a
GS	Gestational Sac	three distances	GS=(d1+d2+d3)/3+ 3.6225	Hellman, A/OG, 103: 789,1969
CRL	Crown Rump Length	one distance	CRL=1.684969+ 0.315646xd1+ 0.049306xd1^2+ 0.004057xd1^3+ 0.000120456xd1^4	Hadlock, Radiology, 182:501, 1992
FL	Femur Length	one distance	FL = –3.91 + 0.427 (GA) – 0.0034 $(GA)^2$	Hadlock et al, Radiology, 152:497–501, 1984
BPD	Biparietal Diameter	one distance	BPD = –3.08+0.41 (GA) – 0.000061 $(GA)^3$	
AC	Abdominal Circumference	circumference by trace, ellipse, circle or two distances	AC = –13.3 + 1.61 (GA) – 0.00998 $(GA)^2$	
HC	Head Circumference	circumference by trace, ellipse, circle or two distances	HC = –11.48 + 1.56 (GA) – 0.0002548 $(GA)^3$	Hadlock et al, Radiology, 152:497–501, 1984
OFD	Occipito Frontal Diameter	HC by ellipse or two distance	Longest axis from HC measurement	n/a
S/D Ratio	Systolic/ Diastolic Ratio	two Doppler blood flow peak velocities	$S/D=V_{systole}/V_{diastole}$ **NOTE**	n/a
A/B Ratio	Velocities Ratio	two Doppler blood flow peak velocities	$A/B = V_1/V_2$	n/a
PI	Pulsatility Index	two Doppler blood flow peak velocities and TAMAX	$PI=(V_{max}–V_{diastole})/$ TAMAX **NOTE**	n/a
RI	Resistivity Index	two Doppler blood flow peak velocities	$RI=(V_{max}–V_{diastole})/V_{max}$ **NOTE**	n/a

**NOTE*:* $V_{diastole} = V_{min}$ or $V_{end–diastole}$

Table 9–3. OB Calculation Formulas Part 1—USA Version Factory Defaults

USA Method (cont'd)

Calc Mnemonic	Calc Name	Input Measurements	Formula	Author Reference
EFW #1	Estimated Fetal Weight	Average of BPD and Average of AC	EFW=10^(-1.7492+0.166*BPD+ (0.046*AC)–((2.646*AC*BPD)/1000))	Shepard, AJOG, 142:47, 1982
EFW #2	Estimated Fetal Weight	Average of FL and Average of AC	EFW=10^(1.304+ (0.05281*AC)+ (0.1938*FL)– (0.004* AC*FL))	Hadlock-Radiology 150:535, 1984
EFW #3	Estimated Fetal Weight	Average of BPD, Average of AC and Average of FL	EFW=10^(1.335–0.0034*AC*FL)+ (0.0316*BPD)+ 0.0457*AC)+ (0.158* FL)	Hadlock, AJOG, 151:333, 1985
EFW #4	Estimated Fetal Weight	Average of FL, Average of AC and Average of HC	EFW=10^(1.326–(0.00326*AC*FL)) + (0.0170*HC)+ (0.0438*AC)+ (0.158*FL))	Hadlock, AJOG, 151:333, 1985
EFW #5	Estimated Fetal Weight	Average of FL, Average of AC, Average of HC and Average of BPD	EFW=10^(1.3596–(0.00386*AC*FL))+ (0.0064*HC)+ (0.00061*BPD*AC)+(0.0424*AC)+ (0.174*FL)	Hadlock, AJOG, 151:333, 1985
EFW Graph	Estimated Fetal Weight Graph	EFW Calculation	LOG EFW Mean (g) = 0.578 + (0.332 * MA) – (0.00354 * MA^2) 1SD = 0.127 * EFW Mean	Hadlock, Radiology, 1991; 181

EFW[g]=exp(0.578+0.332*MA–0.00354*MA^2) where MA is menstrual age [weeks]

Table 9–3. OB Calculation Formulas Part 1—USA Version Factory Defaults (cont'd)

USA Method (cont'd)

Calc Mnemonic	Calc Name	Formula	Author Reference
CUA**	Composite Ultrasound Age	1. CUA(BPD)=9.54+1.482*(BPD)+0.1676*(BPD)^2 2. CUA(HC)=8.96+0.540*(HC)+0.0003*(HC)^3 3. CUA(AC)=8.14+0.753*(AC)+0.0036*(AC)^2 4. CUA(FL)=10.35+2.460*(FL)+0.170*(FL)^2 5. CUA(BPD,AC)=9.57+0.524*(AC)+0.1220*(BPD)^2 6. CUA(BPD,HC)=10.32+0.009*(HC)^2+ 1.3200*(BPD)+0.00012*(HC)^3 7. CUA(BPD,FL)=10.50+0.197*(BPD)*(FL)+ 0.9500(FL)+0.7300*(BPD) 8. CUA(HC,AC)=10.31+0.012*(HC)^2+0.3850*(AC) 9. CUA(HC,FL)=11.19+0.070*(HC)*(FL)+0.2630*(HC) 10. CUA(AC,FL)=10.47+0.442*(AC)+0.3140*(FL)^2– 0.0121*(FL)^3 11. CUA(BPD,AC,FL)=10.61+0.175*(BPD)*(FL)+ 0.2970*(AC)+0.7100*(FL) 12. CUA(HC,BPD,FL)=11.38+0.070*(HC)*(FL)+ 0.9800*(BPD) 13. CUA(HC,AC,FL)=10.33+0.031*(HC)*(FL)+ 0.3610*(HC)+0.0298*(AC)*(FL) 14. CUA(HC,AC,BPD)=10.58+0.005*(HC)^2+ 0.3635*(AC)+0.02864*(BPD)*(AC) 15. CUA(BPD,HC,AC,FL)=10.85+0.060*(HC)*(FL)+ 0.6700*(BPD)+0.1680*(AC) Unit: CUA (week), BPD (cm), HC (cm), AC (cm), FL (cm)	Hadlock, Radiology, 1984 152:497–501
FL/AC	FL/AC ratio	FL/AC	Hadlock, AJR 141:979, 1983
FL/HC	FL/HC ratio	FL/HC	Hadlock, JUM 3:439, 1984
FL/BPD	FL/BPD ratio	FL/BPD	Hadlock, AJOG 141:759, 1987
CI	Cephalic Index	BPD/OFD short distance HC/long distance HC	Hadlock, AJR 137:83, 1981
HC/AC	HC/AC ratio	HC/AC	Campbell, BRJ.OG 84:165,1977

** Formulas are used only if Hadlock HC, FL, AC and BPD are used and the *"CUA/AUA for Hadlock"* preset, found on System Parameters page 3, is set to "CUA". If other authors are used, CUA automatically changes to AUA and an average value is displayed.

Table 9–4. OB Calculation Formulas Part 2—USA Version Factory Defaults

USA Method (cont'd)

Calc Mnemonic	Calc Name	Formula	Author Reference
AFI*	Amniotic Fluid Index	AFI=AFI1 (distance) + AFI2 (distance) + AFI3 (distance) + AFI4 (distance)	Dr. Rutherford/Dr. Phelan, Obstetrics & Gynecology Volume 70, No. 3, Part 1, p. 353–6, Sept. 1987. Dr. C. C. Smith, The Female Patient, Volume 15, p. 85-97, March 1990.

* The skip function using the Ellipse up/down arrow keys is not available for AFI.

Table 9–4. OB Calculation Formulas Part 2—USA Version Factory Defaults (cont'd)

European Method

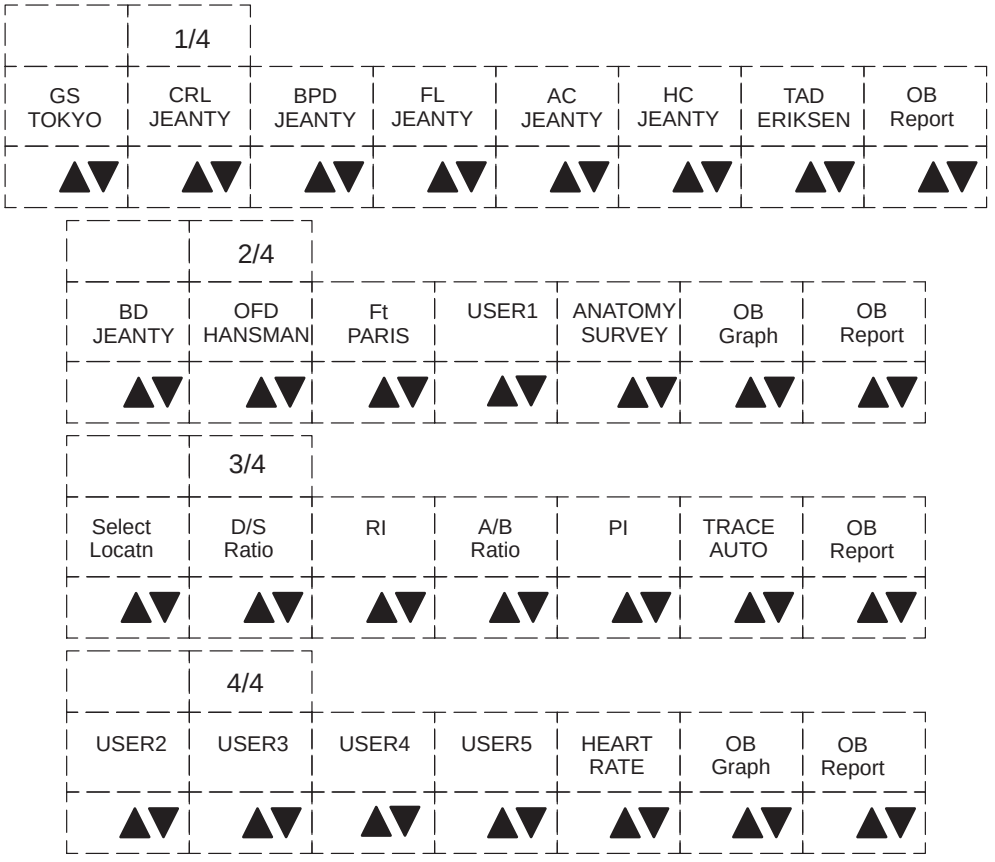


Figure 9–4. European Sub-Menus

European Method (cont'd)

Calc Mnemonic	Calc Name	Input Measurements	Formula	Author Reference
HR	Heart Rate (beats/minute)	one 2 beat time (Measured manually or automatically)	HR[BPM]= 120[sec]/ 2beat time[sec]	n/a
GS	Gestational Sac	one distance	Curve data is available in the Advanced Reference Manual	Tokyo University Method 1986, 6 by Univ. of Tokyo
CRL	Crown Rump Length	one distance		JEANTY : Radiology, 143 : 513, 1982
BPD	Biparietal Diameter	one distance		
HC	Head Circumference	circumference by trace, ellipse, circle or two distances		
AC	Abdominal Circumference	circumference by trace, ellipse, circle or two distances		
FL	Femur Length	one distance	Curve data is available in the Advanced Reference Manual	JEANTY : Radiology, 143 : 513, 1982
BD	Binocular Distance	one distance		
TAD	Transverse Abdominal Diameter	one distance		ERIKSEN
OFD	Occipito Frontal Diameter	one distance	Known LMP Case:	Hansmann: Ultraschalldiag–nostik in Begurtshilfe und Gynakologie 1985
			Unknown LMP Case:	
Ft	Foot Distance	one distance	Curve data is available in the Advanced Reference Manual	PARIS
EFW	Estimated Fetal Weight	Average of BPD and Average of AC [cm]	EFW[g] = 10 ^ (1.7288 + 0.09184*BPD + (0.02581* AC) + (0.00011*BPD*AC))	Shepard/ Warsoff

Table 9–5. OB Calculation Formulas—European Version Factory Defaults

European Method (cont'd)

Calc Mnemonic	Calc Name	Input Measurements	Formula	Author Reference
FL/AC	FL/AC ratio	Average of FL and Average of AC	FL/AC	Hadlock, AJR, 141 : 979, 1983
FL/BPD	FL/BPD ratio	Average of FL and Average of BPD	FL/BPD	Hadlock, AJOG, 141 : 759, 1987
CI	Cephalic Index	Average of BPD and Average of OFD	BPD/OFD short distance HC/long distance HC	Hadlock, AJR, 137 : 83, 1981
HC/AC	HC/AC ratio	Average of HC and Average of AC	HC/AC	
FL/Ft	FL/Ft ratio	Average of FL and Average of Ft	FL/Ft	
BD/BPD	BD/BPD ratio	Average of BPD and Average of BD	BD/BPD	
D/S Ratio	Diastolic/ Systolic Ratio	two Doppler blood flow peak velocities	D/S = $V_{diastole}$/ $V_{systole}$ **NOTE**	n/a
A/B Ratio	Velocities Ratio	two Doppler blood flow peak velocities	A/B = V_1/V_2	n/a
PI	Pulsatility Index	two Doppler blood flow peak velocities and TA_MAX	PI=(Vmax – $V_{diastole}$)/ TA_MAX **NOTE**	n/a
RI	Resistivity Index	two Doppler blood flow peak velocities	RI=(V_{max} – $V_{diastole}$)/ V_{max} **NOTE**	n/a

**NOTE*:* $V_{diastole} = V_{min}$ or $V_{end–diastole}$

Table 9–5. OB Calculation Formulas—European Version Factory Defaults (cont'd)

Other OB Calculation Formulas

Calc Mnemonic	Calc Name	Input Measurements	Formula	Author Reference
BPD	Biparietal Diameter	one distance	Curve data is available in the Advanced Reference Manual	CAMPBELL : King's College Hosp. London (Am.J. obst gynecol). Oct. 1, 1982
FL	Femur Length	one distance		
BD	Binocular Distance	one distance		
GS	Gestational Sac	one distance		HANSMANN: M and Al : Geburtsch, u, Frauenheilk 39 : 656, 1979
CRL	Crown Rump Length	one distance		ROBINSON: Robins on and Al: Br J Gynecol, 82 : 702, 1975
CRL	Crown Rump Length	one distance		PARIS
BPD	Biparietal Diameter	one distance		
TAD	Transverse Abdominal Diameter	one distance		
FL	Femur Length	one distance		
BPD	Biparietal Diameter	one distance		SOSTOA: Hospital de la Santa Cruzy San Pablo, servieio de obst. y gynecol.
HC	Head Circumference	circumference by trace, ellipse, circle or two distances		
AC	Abdominal Circumference	circumference by trace, ellipse, circle or two distances		
FL	Femur Length	one distance		
BD	Binocular Distance	one distance		
OFD	Occipito Frontal Diameter	one distance		
FL	Femur Length	one distance		Hadlock, AJR, 138 : 875, 1982

Table 9–6. OB Calculation Formulas—Other Selections

Other OB Calculation Formulas (cont'd)

Calc Mnemonic	Calc Name	Input Measurements	Formula	Author Reference
BPD	Biparietal Diameter	one distance	Curve data is available in the Advanced Reference Manual	Hadlock, JUM 1:97, 1982
AC	Abdominal Circumference	circumference by trace, ellipse, circle or two distances		Hadlock, AJR, 139 : 367, 1982
HC	Head Circumference	circumference by trace, ellipse, circle or two distances		Hadlock, AJR, 138 : 649, 1982
CRL	Crown Rump Length	one distance		NELSON
BPD	Biparietal Diameter	one distance		KURTZ
BD	Binocular Distance	one distance		BERKOWITZ
EFW	Estimated Fetal Weight	Average of BPD and Average of TAD [mm]	EFW[kg] = 0.515263 –(0.105775*BPD)+ (0.000930707* $(BPD)^2$) + (0.0649145*TAD) – (0.00020562* $(TAD[mm])^2$)	German
EFW	Estimated Fetal Weight	Average of BPD and Average of AC [cm]	EFW [g] = 10 ^ (3–1.7492 + 0.046*AC + 0.166*BPD – 0.002646*AC*BPD)	Shepard : Richards/ Berkowitz
EFW	Estimated Fetal Weight	Average of FL, Average of AC and Average of HC [cm]	EFW [g] = 10 ^ (1.5662 – (0.0108*HC) + (0.0468*AC) + (0.171*FL) + $(0.00034*(HC)^2)$ – (0.003685*AC*FL))	Hadlock, Radiology, 150 : 535, 1984
FL/HC	FL/HC ratio	Average of FL and Average of HC	FL/HC	Hadlock, JUM, 3 : 439, 1984

Table 9–6. OB Calculation Formulas—Other Selections (cont'd)

Other OB Calculation Formulas (cont'd)

Calc Mnemonic	Calc Name	Input Measurements	Formula	Author Reference
GS	Gestational Sac	one distance	Known LMP Case:	Rempen
			Unknown LMP Case:	
CRL	Crown Rump Length	one distance	Known LMP Case:	
			Unknown LMP Case:	
BPD	Biparietal Diameter	one distance	Known LMP Case:	
			Unknown LMP Case:	
BPD	Biparietal Diameter	one distance	Known LMP Case:	Hansmann: Ultraschalldiag–nostik in Begurtshilfe und Gynakologie 1985
			Unknown LMP Case:	
CRL	Crown Rump Length	one distance	Known LMP Case:	
			Unknown LMP Case:	
HC	Head Circumference	Average of BIP Average of FRO	HC [mm = 2.325* (BPD [mm] ^2 + OFD [mm] ^2)^0.5	
ThD	Transverse Thorax Diameter	one distance	Known LMP Case:	
			Unknown LMP Case:	
FL	Femur Length	one distance	Known LMP Case:	
			Unknown LMP Case:	
AC	Abdominal Circumference	one distance	Known LMP Case:	
			Unknown LMP Case:	
EFW	Estimated Fetal Weight	Average of BPD Average of AC	EFW[g] = –3200.40479 + 157.07186 * AC[cm] + 15.90391 * BPD [cm]	Merz, et al., Womens Hospital, University of Mainz
BPD	Biparietal Diameter	one distance	Curve data is available in the Advanced Reference Manual	Tokyo Shinozuka Method, 1996
APTD x TTD (AxT)	Antero Posterior Trunk Diameter Transverse Trunk Diameter	two distance		

Table 9–6. OB Calculation Formulas—Other Selections (cont'd)

Other OB Calculation Formulas (cont'd)

Calc Mnemonic	Calc Name	Input Measurements	Formula	Author Reference
AC	Abdominal Circumference	circumference by trace, ellipse, circle or two distance	Curve data is available in the Advanced Reference Manual	Tokyo Shinozuka Method, 1996
FL	Femur Length	one distance		
CRL	Crown Rump Length	one distance		
EFW1	Estimated Fetal Weight	four distance	EFW1 [gram] = 1.07 * BPD^3 + 3.42*APTDxTTD *FL G = [day] , BPD = [cm], FL = [cm], APTDxTTD = [cm2]	
EFW2	Estimated Fetal Weight	2 distance and 1 circumference	EFW2 [gram] = 1.07 * BPD^3 + 0.30 * AC^2 * FL G = [day], BPD = [cm], AC = [cm], FL = [cm]	
EFW3	Estimated Fetal Weight	four distance	EFW3 [gram] = 1.07 * BPD^3 + 2.91*APTDxTTD* LV G = [day], BPD = [cm], LV = [cm], APTDxTTD = [cm2]	
BPD	Biparietal Diameter	one distance	Curve data is available in the Advanced Reference Manual	ASUM, D. Robinson et al, 1990.8
CRL	Crown Rump Length	one distance		ASUM, Silva et al, 1991.6
AC	Abdominal Circumference	circumference by trace, ellipse, circle or two distance	AC (mm) = –56.582 + 11.402 * (GA–2) GA = [week]	ASUM, Deler

Table 9–6. OB Calculation Formulas—Other Selections (cont'd)

GS Measurement

GS Measurement for the Tokyo University and European methods requires only one distance measurement.

GS Measurement for the USA method requires 3 distance measurements obtained from longitudinal and transverse images. The 3 measurements are anterior–posterior, transverse and longitudinal. It is advantageous to use the dual-image (split screen) feature for this GS measurement.

Amniotic Fluid Index (AFI)

The Amniotic Fluid Index is determined by taking distance measurements of the 4 quadrants of the uterine cavity. These 4 measurements are added together to calculate the Amniotic Fluid Index.

Press the **Measurement** key once to display a "×" cursor on the screen, and to display distance in cm on the bottom part of screen. Select **AFI** from the OB Measurement Soft Menu. The distance measurement changes to AFI1 (2, 3 or 4).

Perform a standard distance measurement as described in

When the measurement of the first quadrant is completed, unfreeze and move to the second quandrant. After the image is obtained, press **Freeze** and then **Measurement**. The user is then prompted to continue with the AFI measurements. Perform a standard distance measurement for the second quadrant.

Repeat these steps for quandrants 3 and 4.

When all 4 quadrants have been measured, the AFI will be calculated and displayed in the Calculation Result Area of the display.

Hints

The skip function using the Ellipse up/down arrow keys is not available for AFI.

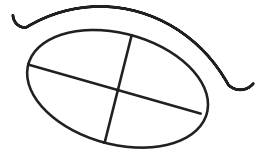
Unfreezing the image after doing an AFI measurement does not delete the previous measurements. Unfreeze and change scan planes as necessary. Make the remaining measurements to arrive at the AFI value by following the basic distance measurement procedure.

If any generic distance measurements are unassigned before invoking the Amniotic Fluid Index these measurements will be used. Only the remaining distance measurements need to be made to arrive at an AFI.

Amniotic Fluid Index (AFI) (cont'd)

The normal values are considered to be:

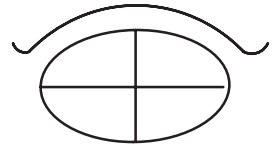
36–40 weeks
0–5 cm = very low
5.1–8.0 cm = low
8.1 – 18.0 cm = normal
>18.0 = high



Sagittal

Dr. Rutherford/Dr. Phelan, *Obstetrics and Gynecology*, Volume 70, No. 3, Part 1, p. 353–6, Sept. 1987.

28–40 weeks
15.0 cm = average
>20.0 – 24.0 = hydramnios
<5.0–6.0 = Oligohydramnios



Transverse

Dr. C.C. Smith, *The Female Patient,* Volume 15, p. 85–97, March 1990.

Select **AFI** from the OB Measurement Soft Menu.

EFW Using User Programmable Table Measurements

If it is desired to use User Programmable Table measurements in the calculation and reporting of EFW, perform the following steps:

System Setup

1. Create the desired User Programmable Tables as described on *14–75*.
2. Assign the User Table measurement to the proper Measurement Mode Menu as described on *14–84*.
3. Assign the User Programmable Table measurement to the desired Report Page as described on *14–72.*

Calculating EFW

4. Perform the measurements used in the calculation of EFW.

   For example, if Tokyo method is selected in the OB Report Format, found in System Parameters page 2, EFW is calculated by measuring BPD, FL, APTDxTTD. If user programmable tables are used in the measurement of BPD, FL and/or APTDxTTD, these measurements should be performed first prior to the factory default measurements [i.e. FL (user1), BPD, FL, APTDxTTD].

After all measurements have been completed, EFW is not displayed in the measurements results area, but is displayed on the Report Page.

Hints

If it is desired to use User Programmable Table measurements in the calculation of EFW, it would be helpful to program a User Measurement Sequence as described on *14–79*.

If measurement averaging is active, EFW will be calculated from the average of similar factory default and user programmable table measurements.

User-Programmed Calculations (Tables)

User-programmed calculation tables are displayed in the measurement menus only after they are entered by the user.

The User Table Editor is found in the Set Up/Preset Program Menu page 7. Refer to *14–75* on how to define these user selections and program the user tables.

Select Locatn

This choice is used to select 1 of 3 locations at which S/D (D/S) Ratio, A/B Ratio, RI and PI can be taken and recorded on the report page.

The locations are numbered 1, 2 and 3 as a default from the factory. However, the user can customize each location designation with a 6 character name. This customization edit is done in any report page that displays S/D (D/S) Ratio, A/B Ratio, RI or PI. Changes will be permanently saved even after system power down.

Up to three measurements can be taken for S/D (D/S) Ratio, A/B Ratio, RI or PI. The latest value or measurement average can be reported. Averaging depends upon the average activity preset selection in the Set Up/Preset Program page 3.

Press the **Select Locatn** up/down arrow keys to change the location number as necessary.

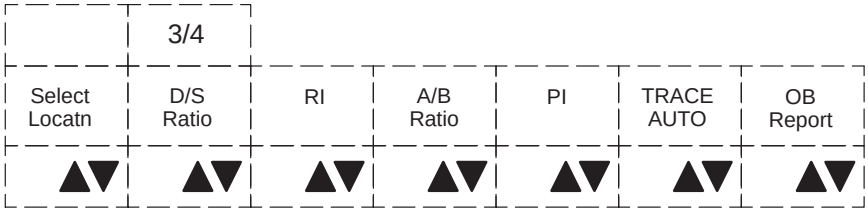


Figure 9–5. European OB Calculation Sub-Menu

S/D (D/S) Ratio, A/B Ratio, RI or PI

Refer to the procedure found on *10–29*.

Trace Auto

Use the Trace Auto Sub-Menu selection to turn on/off the Doppler Auto Trace function. See *10–28* for more details.

Fetal Heart Rate Measurement

The fetal heart rate is typically taken in M-Mode, though it also can be performed in Doppler Mode. Refer to the procedure found on *10–30*.

Helpful Hints

Hints

- Any measurement can be repeated by selecting that measurement again from the Soft-Menu.
- The system displays several measurements, but the summary report retains only the last 3 measurements of each type.
- The 3 report page measurements can be averaged and the average used in other calculations. This averaging selection is made in the Set Up/Preset Program page 3. Average activity on/off and average number (number of measurements averaged) can be set to the user's preference. Other presets on this page that affect OB measurements for the European method are Add 1 week to EDD and Display EDD with GA value.
- If results are displayed as question marks, the measurement is not within the table range.

OB Summary Reports

Starting an Exam

Accurate and complete Summary Report presentation starts at the beginning of the patient exam. Always begin an exam by entering as much new patient information as possible.

NOTE: Refer to the Beginning an Exam section on 4–3 for instructions.

After selecting the OB exam type, fill in the following information after PT Name, PT ID, Notes, and Oper ID:

1.	**AGE**.	Type the woman's age.
2.	**PREGNANCY ORIGIN DATA SELECTION** .	Enter 1 for LMP, 2 for BBT (not in USA version), 3 for EDC (EDD in Europe) and 4 for GA. Type in the required information for category selected.

NOTE: If this step (#2.) is omitted, growth percentiles and asterisks will not be displayed on the OB Report Page and OB Graphs, respectively

3.	**GRAVIDA**.	Type the number of pregnancies.
4.	**PARA**.	Type the number of live births.
5.	**AB**.	Type the number of abortions, miscarriages, etc.
6.	**ECTOPIC**.	Type the number of pregnancies outside the uterus.
7.	**REF. MD**.	Type the name of the woman's physician.
8.	**COMMENT**	Type any pertinent medical history with regard to this pregnancy, e.g., diabetes, bleeding.

Starting an Exam (cont'd)

9. **EXIT** — Press **Return** after having completed filling in this information.

*NOTE: If patient information needs to be edited, use the **ID/Name** key to display the patient entry menu for editing information.*

OB Report Page Layout

The basic OB Report format consists of 2 pages for each region available (USA, Europe, Tokyo University and Osaka University).

The first page consists of 4 basic areas. The first, or top portion, is generally patient data that was entered on the patient entry menu at the beginning of the exam. This area cannot be edited.

The second is the measurements area. It varies by region format. Generally this area contains measurement titles, the last 3 measurements made, the measurement average (if averaging is used), estimated gestational age and the ability to choose if the measurement is used in the calculation of the composite age. This area can be edited by deleting measurements, selecting yes/no for composite age or rearranging the vertical location of a measurement using the Report Format Editor in the Set Up/Preset Program page 7.

The third area is calculations. It varies by region format. These items are results of measurements or patient data entered on the Patient Entry Menu. This area cannot be edited.

The fourth area is comments. The same amount of area is available for user comments for each region. The user can edit this area freely. Comments made on page 1 are not reflected on page 2. Therefore, comments on each page can be edited individually.

OB Report Page 1

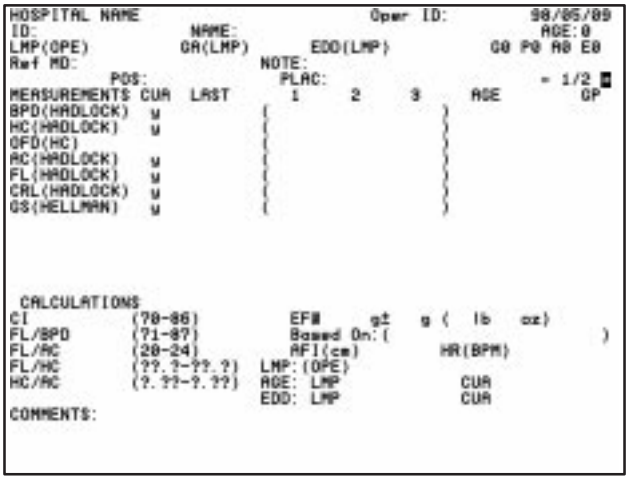


Figure 9–6. USA Basic OB Summary Report Page 1

NOTE: When the head circumference (HC) is measured by the ellipse or 2 distance method, the longer axis will automatically be assigned as the OFD measurement.

<AVG> or <LAST> indicates that the Average or Latest value will be displayed in this column. This depends on the preset, *Average Activity*, in the Set Up/Preset Program menu page 3.

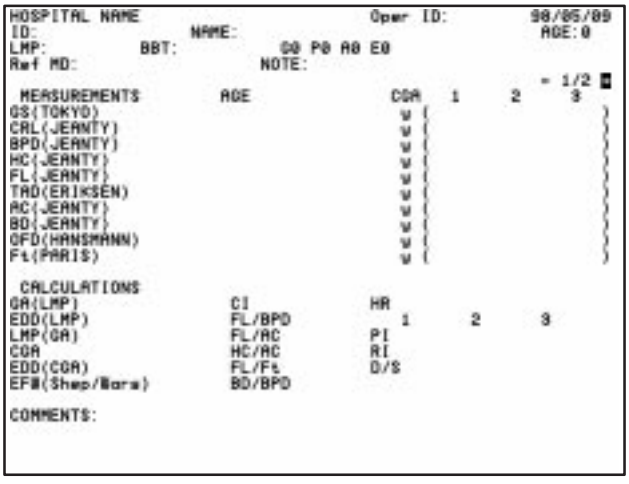


Figure 9–7. European Basic OB Report Page 1

OB Report Page 1 (cont'd)

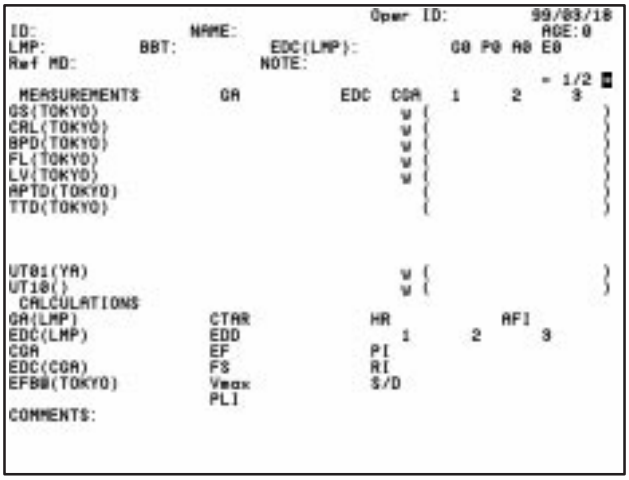


Figure 9–8. Tokyo University Basic OB Report Page 1

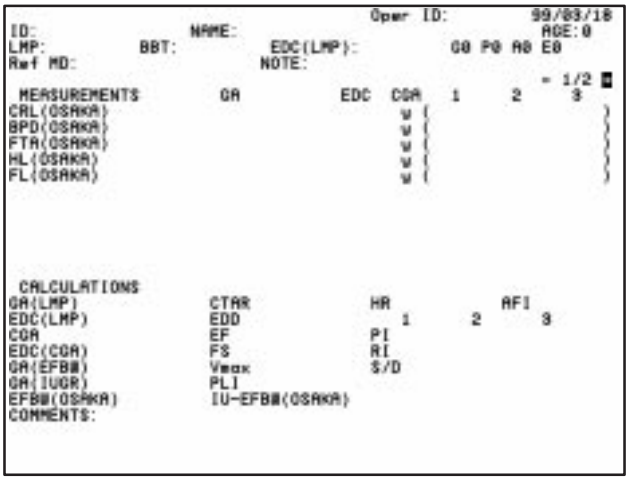


Figure 9–9. Osaka University Basic OB Report Page 1

Composite Age Determination

The composite fetal age is displayed as CUA (Composite Ultrasound Age) on the USA Report and CGA (Composite Gestational Age) on the European, Tokyo University and Osaka University Reports.

NOTE: There is a preset selection to choose how gestational age is derived for the USA Hadlock formulas. The "CUA/AUA for Hadlock" preset, found on System Parameters page 3, allows gestational age to be derived by linear regression (CUA) or averaging (AUA).

The CUA or CGA field can be edited on the report page by the designation 'Y' for yes or 'N' for no.

'Y' will include the last measurement or measurement average in the calculation composite age. Changing the CUA/CGA designation to 'N' will exclude the measurement from the composite age calculation. The default value is 'Y'.

NOTE: There is a preset selection on Set Up/System Parameters page one that allows for the resetting of the CUA fields at New Patient selection (Reset on or off).

Fetal Weight Estimates

The estimated fetal birth weight calculation varies by region. EFW or EFBW is calculated for:

USA Version—The system automatically selects 1 of the 5 available formulas based on the measurements taken. Refer to *9–13* for formula details.

Tokyo or European Version—It is based on the formula selected in the Set Up/System Parameter menu page 2.

Osaka University Version—It is based on a single formula listed on *9–10*. Standard Deviation is also displayed with EFBW in the Osaka University OB Report.

OB Report Page 2

<AVG> or <LAST> indicates that the Average or Latest value will be displayed in this column. This depends on the preset, *Average Activity*, in the Set Up/Preset Program menu page 3.

SITE — represents a Doppler site that the user can edit with a maximum of 6 characters. Factory default labels are 1, 2 and 3.

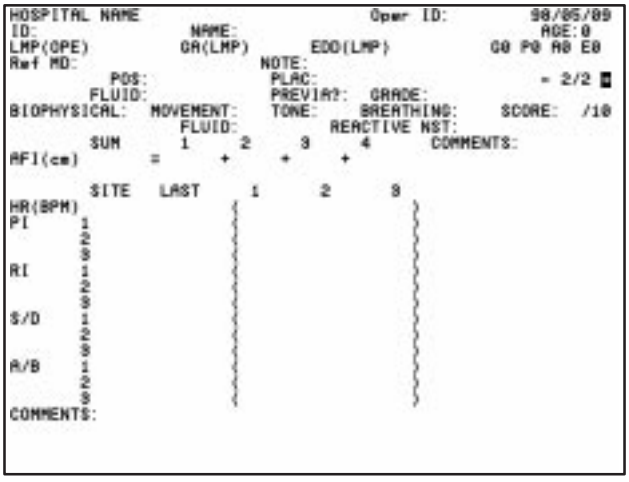


Figure 9–10. USA Basic OB Summary Report Page 2

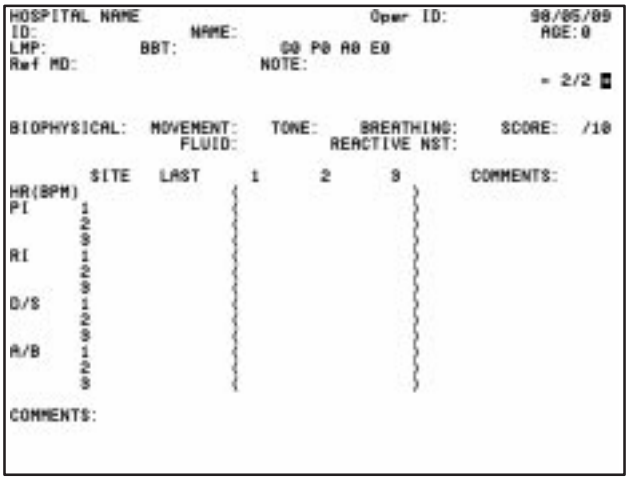


Figure 9–11. Basic OB Report Page 2 for Europe, Tokyo University and Osaka University

Biophysical Profile

A biophysical profile source is available to evaluate the well being of the fetus. The user can rate the fetus with a score of 0, 1 or 2 on the following items:

- Movement — Rate fetal physical activity
- Tone — Rate fetal tone
- Breathing — Rate fetal breathing movement
- Fluid — Rate fetal amniotic fluid
- Reactive NST — Rate a Reactive Non-Stress Test

A sum of the above 5 items is then displayed as an overall biophysical profile score.

If any value is entered other than 0, 1 or 2 for each of the 5 items, an error message “Invalid, Input a proper data (0–2)” is displayed.

HR, PI, RI, S/D (D/S) Ratio and A/B Ratio

The largest portion of page 2 displays the last 3 measurements and latest/average value for HR, PI, RI, S/D (D/S) Ratio and A/B Ratio. The last 4 measurements can be taken at 3 different sites on the fetus.

The factory default for these site fields is 1, 2 and 3. However, the user can freely edit these site fields on the Report Page. For some regions, these site fields may be common between pages 1 and 2. If this is the case, edits on either page are reflected on the other. These edits are remembered after power down. The maximum length of the site field is 6 characters.

The comments section can be edited freely using the alphanumeric keyboard or annotation library. Simply move the highlight cursor into the comment area and press the **Comment** key. The system is now in the annotation mode. When the highlight cursor leaves the comment area, the system exits the annotation mode. These comments are separate from those on page 1.

USA Only

Two items are different on the OB Summary Report page 2 for the USA version.

1. The third line of the top portion will display all of the LMP, GA and EDD data based on the operator's input. For example, if LMP was entered:

LMP (OPE) mm/dd/yy GA (LMP) ##W#D EDD (LMP) mm/dd/yy

will be displayed.

2. Amniotic Fluid Index (AFI) displays the sum of the 4 measurements and the 4 individual measurement values.

Editing the Report

Cursor Movement

Movement of the edit cursor on the report page can be accomplished by using the Trackball or the up/down/left/right arrow keys on the keyboard.

Edit Actions

When positioned on a measurement field the **Back Space** or **Space** keys will delete the current value in that field. After pressing **Back Space** or **Space**, the only options remaining are to press **Set** or **Esc**.

Set deletes the old value.

Esc returns the old value to the report page.

NOTE: Any calculations relating to the deleted measurement field are recomputed.

Logic Field Edits

The CUA/CGA field requires a “Y” or “N” to be entered in either upper or lower case.

When the cursor is positioning in the desired field, press “Y” or “N”. Once yes or no has been entered, press **Return** to record that entry and proceed to the next edit field.

NOTE: Calculations affected are recomputed.

Comment Edits

The comment field consists of 2 lines with a total of 120 characters. Use normal keyboard functions to type necessary comments.

Comments made on each report page are not reflected on the other report pages. Therefore, comments on each page can be edited individually.

When finished, press **Return** to complete the comment edit function. Since this is the last edit field on the report page, the cursor moves to the first edit field.

Measurement Edits

Measurements on the OB Report Page can only be edited by deletion. After a measurement is deleted, the average or other related calculations will be recomputed and the report page displayed again.

Operator Entered Values

In the calculations section of the report page, if the value is a result of operator entered data (generally from the patient entry menu) and not measurements, the designation “OPE” is seen after the calculation name.

An example would be EDD (OPE). This means the estimate date of delivery was a value entered by the operator on the patient entry menu.

Recording Summary Reports

The summary report can be saved like any ultrasound image. Once it is displayed on the screen, it can be recorded on the VCR, printed on the B/W or color page printer, photographed by the multi-image camera, stored on a MOD with the Image Archive option or placed on regular paper with a line printer.

Line Printer Operation

USA Only

Refer to *13–15* for details on line printer operation.

Anatomical Survey

Overview

The Anatomical Survey page provides a checklist that promotes a thorough routine reporting of OB exams.

The header of the page is patient data similar to the corresponding OB Report page. This information can only be edited by using the **New Patient** or **ID Name** keys.

The third line of the header will be different depending on the type of OB Report Format selected.

There are 13 pre-programmed and a maximum of 6 user programmable anatomical features.

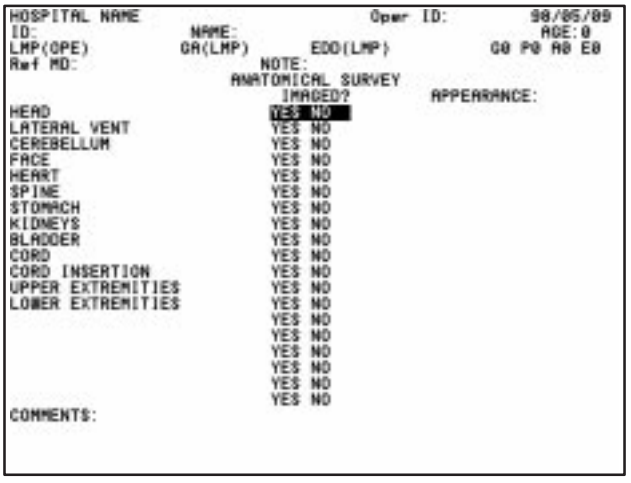


Figure 9–12. Anatomical Survey Page

Editing

When the Anatomical Survey Page is enabled from the OB calculation menu, the highlight cursor appears at the YES/NO field of the first feature on the checklist. Both Yes and No are displayed for all items on the list.

The highlight cursor is moved by the **Trackball** or the up/down/ left/right arrow keys.

YES/NO will appear in the “IMAGED?” column even if there is no entry in the user programmed fields. Select yes by pressing ‘Y’ on the keyboard. When yes is selected, no will be erased. The cursor automatically moves to the comments field.

In the comments field, comments can be entered by typing or selecting annotations from the Soft-Menu. One line of comments is available for each anatomical feature. Press **Return** when completed.

NOTE: Any meaningless entries will display the message: “Please select ‘y’ or ‘n’.” or *“Please select ‘n’ or ‘a’.”*

User Programmed Features

The user can program 6 anatomical feature fields. The maximum number of characters is 19.

To enter a user feature:

Trackball the highlight cursor to a User Field.

Type in the desired feature name and press **Return**. The highlight cursor moves to the Yes/No field.

Repeat the steps as necessary for any additional feature fields.

The entries will be saved and retained even after the system is powered down.

Hints

While in a user programmed field, rolling the Trackball up/down or pressing the up/down arrow keys have no effect on cursor position. Only motion of the Trackball to the left/right or pressing the left/right arrow keys will work.

OB Graphs

Overview

The LOGIQ™ 400 can display a fetal growth curve graph (OB Graph) from data in each measurement table for fetal age.

The graphic displays a horizontal scale for gestational weeks and a vertical scale for the measurement value. The curve graphic shows the standard values with 2 additional curves representing the standard deviation.

If the pregnancy origin data selection field was entered on the patient data entry menu, an asterisk (*) is displayed on the graph to show the current status of the fetus relative to the measurement table.

The OB graph page also has patient data fields, measurement/calculation data fields and a comment field.

The system does not allow any field on the OB graph to be edited.

NOTE: The Pregnancy Origin Data Selection (LMP, BBT, EDC, EDD or GA) is required in order to properly compute the OB Graph. Ensure that this is properly entered in the Patient Entry Menu.

OB Graph Selection

OB Graph is a factory default selection in the measurement menus. Select **OB Graph** from the Measurement Menu.

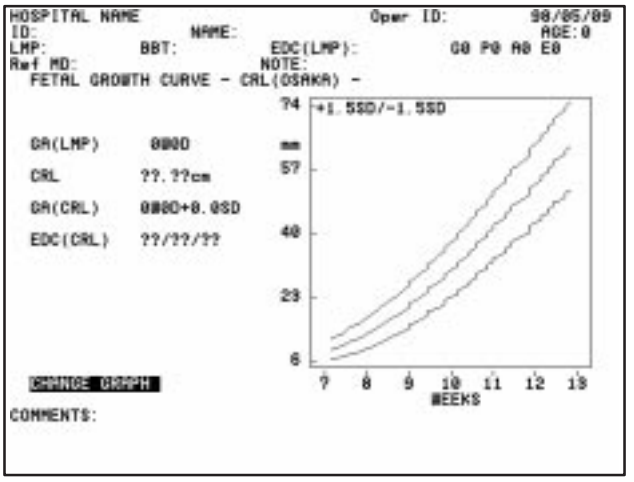


Figure 9–13. Basic OB Graph Display (Osaka University)

NOTE: The label in the upper left corner of the graph indicates the standard deviation used to plot the graph.

NOTE: The system does not allow the selection of a default graph. The first graph displayed is always the last B-Mode measurement calculated.

OB Graph Labeling

Refer to the *Advanced Reference Manual* for the labeling found in the OB Graph for standard deviation.

OB Graph Labeling (cont'd)

Author	Measurement table	Deviation	Deviation Label
Hadlock	BPD, HC, AC, FL	Vertical	+2SD/–2SD
	CRL	—	No Label
	EFW	Vertical	+2SD/–2SD
Hellman	GS	—	No Label
ASUM	BPD, AC	Horizontal	+2SD/–2SD(WEEK)
	CRL	—	No Label
Tokyo	GS, CRL, BPD, FL, LV	Horizontal	Deviation(WEEK)
Tokyo–S (Shinozuka)	CRL, BPD, FL, AC, AxT(APTDxTTD), EFW	Vertical	+1.64SD/–1.64SD
Osaka	CRL, BPD, FL, HL, FTA, EFBW	Vertical	+1.5SD/–1.5SD
Hansmann	BPD, CRL, OFD, HC, TThd, FL	Vertical	95%/5%
	GS, TAD	Vertical	90%/10%
	AC	—	No Label
Rempen	GS, CRL, BPD	Vertical	95%/5%
Campbell	BPD, CRL, FL	Vertical	90%/10%
	BD	—	No Label
Berkowitz	BD	—	No Label
Eriksen	TAD	—	No Label
Kurtz	BPD	Vertical	90%/10%
Nelson	CRL	Vertical	90%/10%
Robinson	CRL	Vertical	90%/10%
Jeanty	CRL, BPD, FL, AC, HC	Vertical	90%/10%
	BD	—	No Label
Paris	CRL, BPD, FL, Ft	Vertical	90%/10%
	TAD	—	No Label
Sostoa	BPD, FL, AC, HC	Vertical	90%/10%
	BD, OFD	—	No Label
User Table USA		Horizontal	Deviation(WEEK)
User Table TOKYO		Horizontal	Deviation(WEEK)
User Table OSAKA		Vertical	+1.5SD/–1.5SD
User Table Europe		Vertical	90%/10%

Table 9–7. OB Graph Deviation Labeling

Changing OB Graph Selection

After the OB graph has been displayed, the user can change or select which measurement parameter is to be used to display a graph.

Highlight CHANGE GRAPH and press **Return**. The graphic is deleted and a measurement selection menu appears.

Select the desired measurement value and press **Return**. The new measurements, calculations and graphic are displayed.

Exit OB Graph

Select **OB Graph** in the OB Calculation Sub-Menu.

Hints

The user is not allowed to edit any field on the OB Graph display except the Comments section. Comments on the OB Graph page are different from any other OB Report Page.

If the Pregnancy Origin Data Selection is not entered on the Patient Entry Menu screen, the mark (*) indicating the current status of the fetus will not be displayed on the graph.

Advanced Obstetrical Options

Options

The following advanced options are available for monitoring fetal development. Refer to the *Advanced Reference Manual* for further details.

Fetal Trend Management

Patient data, measurements and calculations must be saved on the hard drive or MOD during the initial examination. During follow-up examinations, the OB Graph function can display the current data or combine the current data with past data to show a fetal growth trend.

Multigestational OB

The LOGIQ™ 400 offers an optional calculation package that allows the user to measure and report multiple fetus development. The system is capable of reporting a maximum of 4 fetuses.

Data Management Center (DMC)

The LOGIQ™ 400 is capable of interfacing with a personal computer (PC). This interface is used to send OB, GYN and Vascular measurement and calculation data from the LOGIQ™ 400 to the PC for display, processing and evaluation.

Additionally, the LOGIQ™ 400 can accept patient id data from a personal computer (PC) and transfer it to the patient entry menu.

GYN Measurements

B-Mode

Ovarian Length, Height, and Width

The length, height and width of the left and right ovaries can be measured and recorded on the GYN summary report.

Each measurement is a typical distance measurement made on a B-Mode image in the appropriate scan plane.

Typically, the height and width are measured on the axial plane while the length is measured on the sagittal plane.

To measure ovarian length:

Scan the patient's right or left ovary in the sagittal plane.

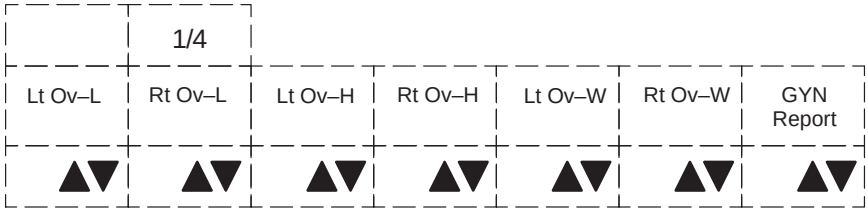


Figure 9–14. GYN Calculation Sub-Menu

Select **Rt Ov-L** or **Lt Ov-L** from the GYN Calculation Sub-Menu. Perform a standard distance measurement as described in *7–7*.

To measure ovarian height and width:

Scan the patient's right or left ovary in the axial plane.

Select **Rt Ov-H**, **Rt Ov-W**, **Lt Ov-H** or **Lt Ov-W** from the GYN Calculation Sub-Menu. Perform the necessary distance measurements as described in *7–7*.

Uterine Length, Height, and Width

The GYN Calculation Sub-Menu page 2 allows for measurements to be recorded as uterine length (Ut-L), height (Ut-H) or width (Ut-W). Length is typically measured in the sagittal plane while height and width are measured in the axial plane.

Scan the patient in the appropriate scan plane.

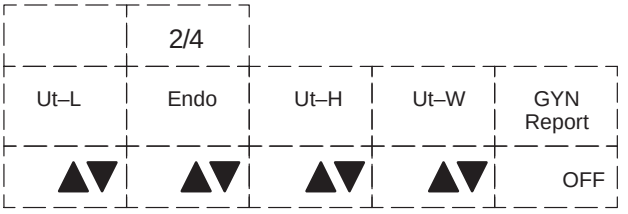


Figure 9–15. GYN Calculation Sub-Menu

Select the desired measurement from the GYN Calculation Sub-Menu (Ut-L, Ut-H or Ut-W).

Measurements are recorded on the GYN Summary Report. The last 3 measurements of each type can be averaged by the Summary Report Page.

Ovary Follicles Measurements

Ovary Follicle (LtOvFo or RtOvFo) Measurements are available in the GYN Calculation Sub-Menu page 3.

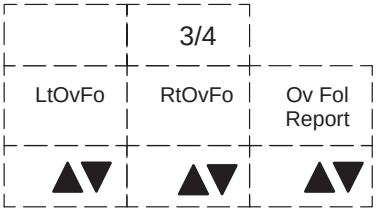


Figure 9–16. GYN Calculation Sub-Menu

LtOvFo or RtOvFo measurements are calculated from one, two, or three distances.

Endometrium Thickness

An endometrium thickness measurement is also available on the GYN Calculation Sub-Menu.

Scan the patient. Select **ENDO** from the GYN Calculation Sub-Menu. Perform a standard distance measurement as described in *7–7*.

Doppler Mode

Three GYN related measurements can be taken in Doppler Mode and recorded on the GYN Summary Report. These are resistive index measurements for a left ovarian vessel, uterine vessel and right ovarian vessel.

NOTE: If the Doppler option is not installed with the LOGIQ™ 400 Black/White systems, the Doppler Mode measurements cannot be performed.

Resistive index

RI measurements are velocity values measured on the Doppler Spectrum for vessels in the ovaries and uterus.

To make GYN Resistive Index measurements:

Scan the desired vessel in Doppler mode.

Select the desired **RI** measurement from the GYN Calculation Sub-Menu.

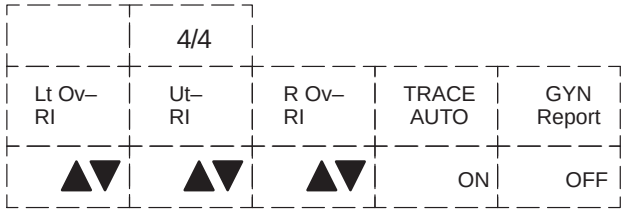
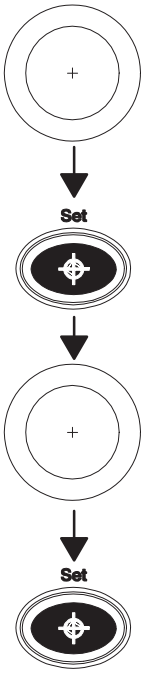


Figure 9–17. GYN Calculation Sub-Menu



Use the **Trackball** to move the cursor to the peak point of the Doppler waveform where it is desired to start the RI measurement.

Press **Set** to fix the start-point cursor. An end-point cursor appears.

Use the **Trackball** to move the end-point cursor to the diastolic point of the Doppler waveform.

Press **Set** to complete the measurement. A calculated value is displayed and stored in the GYN Summary Report.

GYN Summary Report

GYN Report Pages

GYN Report Layout

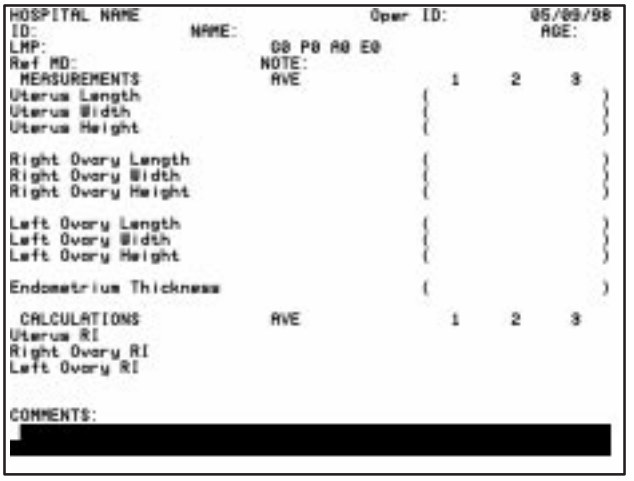


Figure 9–18. GYN Report Page

The top portion of the report contains patient information entered into the Patient Entry Menu.

The middle portion of the report (measurements) shows the last 3 measurement values made. <AVG> or <LAST> indicates that the Average or Latest value will be displayed in this column. This depends on the preset, *Average Activity*, in the Setup/Preset Program menu page 3.

The calculation section shows Doppler measurements and their average, while the comments area provides 2 lines of comment data.

Ovary Follicles Report Layout

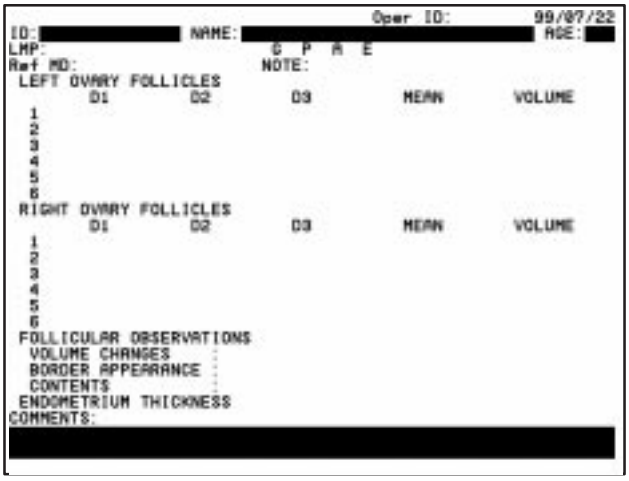


Figure 9–19. Follicles Report Page

The top portion of the report contains patient information entered into the Patient Entry Menu.

The middle portion of the report (measurements) shows the 3 fields in which measured distances are reported. Mean indicates the average of the one, two, or three distance measurements. Volume is calculated from one, two or three distances.

The Follicular Observation area (volume changes, border appearance and contents) provides an area to input the appropriate descriptions.

Endometrium thickness is displayed when the Endo measurement is performed. The comments area provides 2 lines of comment data.

Calculation Formulas

GYN Calculation Formulas

Calc Mnemonic	Calc Name	Input Measurements	Formula
UT-L	Uterine Length	one distance	Ut-L[cm or mm]=d1
UT-H	Uterine Height	one distance	Ut-H[cm or mm]=d1
UT-W	Uterine Width	one distance	Ut-W[cm or mm]=d1
Endo	Endometrium Thickness	one distance	Endo[cm or mm]=d1
Lt. Ov-L	Left Ovarian Length	one distance	Lt. Ov-L[cm or mm]=d1
Lt. Ov-H	Left Ovarian Height	one distance	Lt. Ov-H[cm or mm]=d1
Lt. Ov-W	Left Ovarian Width	one distance	Lt. Ov-W[cm or mm]=d1
Rt. Ov-L	Right Ovarian Length	one distance	Rt. Ov-L[cm or mm]=d1
Rt. Ov-H	Right Ovarian Height	one distance	Rt. Ov-H[cm or mm]=d1
Rt. Ov-W	Right Ovarian Width	one distance	Rt. Ov-W[cm or mm]=d1
Lt. Ov-RI	Left Ovarian Vessel Resistive Index	two Doppler blood flow peak velocities	Lt. Ov-RI= $(V_{max}–V_{diastole})/V_{max}$ **NOTE**
Ut-RI	Uterine Vessel Resistive Index	two Doppler blood flow peak velocities	Ut-RI= $(V_{max}–V_{diastole})/V_{max}$ **NOTE**
Rt. Ov-RI	Right Ovarian Vessel Resistive Index	two Doppler blood flow peak velocities	Rt. Ov-RI= $(V_{max}–V_{diastole})/V_{max}$ **NOTE**
LtOvFo[ml]	Left Ovary Follicles	One distance*	$D1[cm]^3 \times \pi/6$
		Two distances*	$D1[cm]^2 \times D2x[cm] \pi/6$: (D1 <D2)
			$D1[cm] \times D2[cm]^2 \times \pi/6$: (D2 <D1)
		Three distances	$D1[cm] \times D2[cm] \times D3[cm] \times \pi/6$
RtOvFo[ml]	Rith Ovary Follicles	One distance*	$D1[cm]^3 \times \pi/6$
		Two distances*	$D1[cm]^2 \times D2[cm] \times \pi/6$: (D1 <D2)
			$D1[cm] \times D2[cm]^2 \times \pi/6$: (D2 <D1)
		Three distances	$D1[cm] \times D2[cm] \times D3[cm] \times \pi/6$

**NOTE*:* $V_{diastole} = V_{min}$ or $V_{end–diastole}$

* To calculate LtOvFo or RtOvFo with one (or two distances), press the **Clear** key after the first (or second distance) measurement(s).

Table 9–8. GYN Calculation Formulas

Introduction

Overview

The basic cardiac measurement package offers a choice of LV Measurement methods. Analysis of the left ventricle can be performed by 6 different methods.

- Cubed method
- Teichholz method
- Bullet method
- Modified Simpson's Rule method
- Single-plane method
- Biplane ellipsoid method

Each selection requires a series of related measurements specific to that method.

Selection of the LV measurement method is made from the initial Cardiac Calculation Sub-Menu.

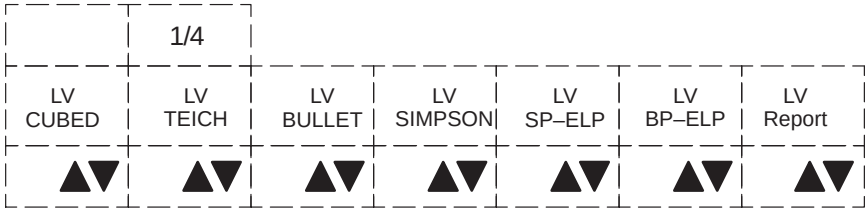


Figure 10–1. Cardiac Calculation Sub-Menu

Overview (cont'd)

Once the LV measurement method is chosen, a Sub-Menu with the available measurement selections appears.

In general, measurement techniques are the same as those described in the *General Measurements and Calculations* chapter. After selecting a measurement, be sure to follow the prompts on the image screen.

Measurements are organized in sequence to streamline system usage and give easy access to calculated values on the report page. Some dependent calculations require several measurements to be taken before the result can be calculated.

NOTE: If the Doppler option is not installed with the LOGIQ™ 400 Black/White systems, the Doppler Mode measurements cannot be performed.

Report Pages

<AVG> or <LAST> indicates that the Average or Latest value will be displayed in this column. This depends on the preset, *Average Activity*, in the Set Up/Preset Program menu page 3.

The 3 report page measurements can be averaged and the average used in other calculations.

After displaying an LV Summary Report, the calculation method can be changed by moving the highlighted cursor to “Change Method” and pressing **Set**.

The current report will be cleared and a method selection menu appears. Use the **Trackball** to select a new LV method and press **Set**.

After pressing **Set** the new LV method report is displayed.

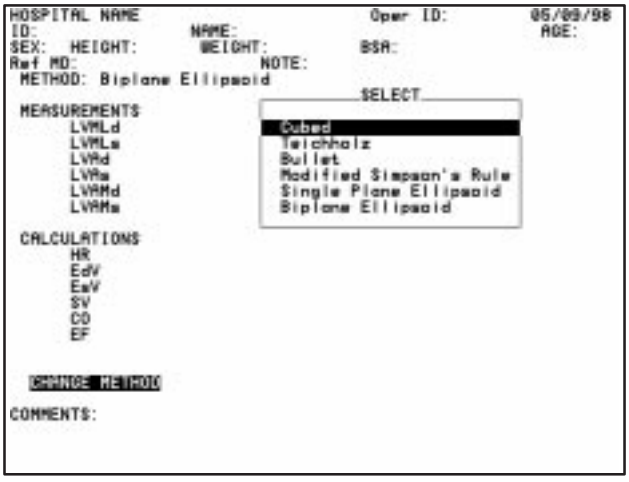


Figure 10–2. Report Page Change Method

Recording Summary Reports

The summary report can be saved like any ultrasound image. Once it is displayed on the screen, it can be recorded on the VCR, printed on the B/W or color page printer, photographed by the multi-image camera, stored on a MOD with the Image Archive option or placed on regular paper with a line printer.

USA Only

Line Printer Operation—Refer to *13–15* for details on line printer operation.

BSA Calculation Methods

The LOGIQ™ 400 can calculate BSA (Body Surface Area) by 2 different formulas, depending on the method selected in the Set Up/System Parameter Menu page 2.

Oriental Formula

$$BSA\ [m^2] = (Height\ [cm])^{.03} \times (Weight\ [g])^{A} \times 3.207 \times 10^{-4}$$

$$A = 0.7285 - 0.0188 \times \log (Weight\ [g])$$

Occidental Formula

$$BSA\ [m^2] = (0.425 \times \log (Weight\ [g]) + 0.725 \times \log (Height\ [cm]) + 1.8654) \times 10^{-4}$$

NOTE: *1 inch = 2.54 cm*
1 lb = 453.59243 g
g = grams
cm = centimeters

Measuring Heart Rate (HR)

Refer to the procedure found on *10–30*.

LV Measurement Methods

Cubed Method

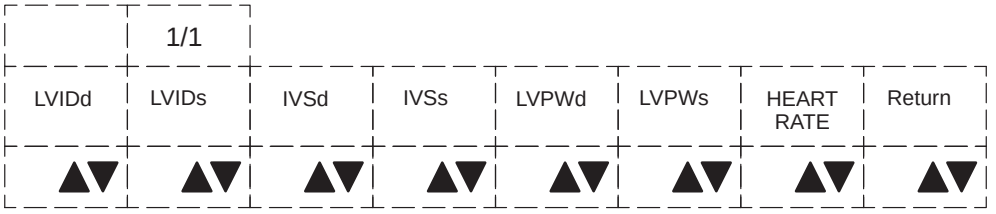


Figure 10–3. Cardiac Calculation Sub-Menu—Cubed Method

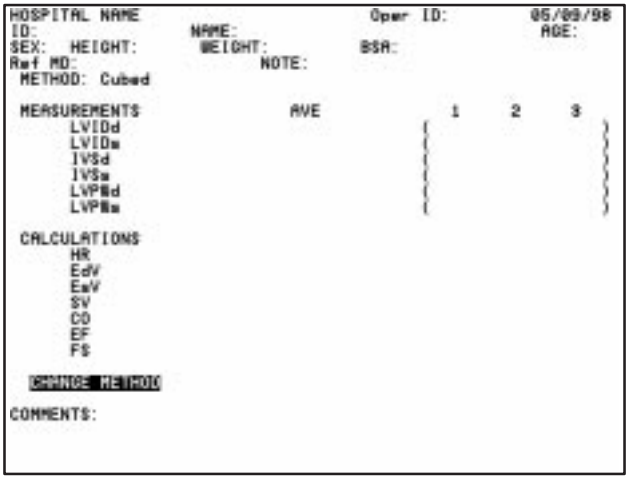


Figure 10–4. Cubed Report Page Display

Cubed Method (cont'd)

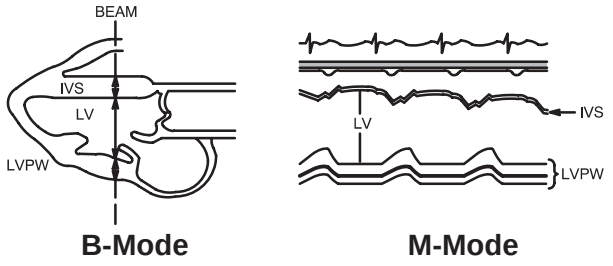


Figure 10–5. Cubed Method Measurements

Calc Mnemonic	Calc Name	Input Measurements	Formula
LVIDd	Left Ventricular Internal Diameter, Diastole	one distance	LVIDd=d1[cm or mm]
LVIDs	Left Ventricular Internal Diameter, Systole	one distance	LVIDs=d1[cm or mm]
IVSd	Interventricular Septal Thickness, Diastole	one distance	IVSd=d1[cm or mm]
IVSs	Interventricular Septal Thickness, Systole	one distance	IVSs=d1[cm or mm]
LVPWd	Left Ventricle Posterior Wall Thickness, Diastole	one distance	LVPWd=d1[cm or mm]
LVPWs	Left Ventricle Posterior Wall Thickness, Systole	one distance	LVPWs=d1[cm or mm]
EdV	End Diastole Volume	one distance	EdV[ml]=LVIDd^3
EsV	End Systole Volume	one distance	EsV[ml]=LVIDs^3
SV	Stroke Volume	two distance	SV[ml]=EdV–EsV
CO	Cardiac Output	two distances and one 2 beat time interval	CO[1/min]= SVxHR/1000
EF	Ejection Fraction	two distances	EF=SV/EdVx100
FS	Fractional Shortening	two distances	FS=(1–LVIDs/ LVIDd)x100
HR	Heart Rate (beats/minute)	one 2 beat time interval	HR[BPM]=/120 [sec]/2 beat time [sec]
PHT	Pressure Half Time	one time interval	PHT=t1[ms orsec]
MVA	Mitral Valve Area	one pressure half time interval	MVA[cm^2]= 220/PHT
ET	Ejection Time	one time interval	ET=t1[ms or sec]

Table 10–1. Cubed Method Formulas

Teichholz Method

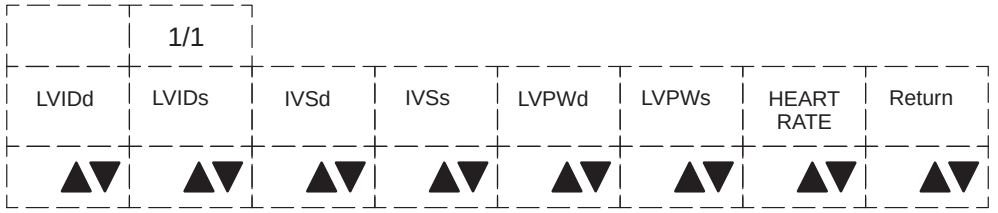


Figure 10–6. Cardiac Calculation Sub-Menu—Teichholz Method

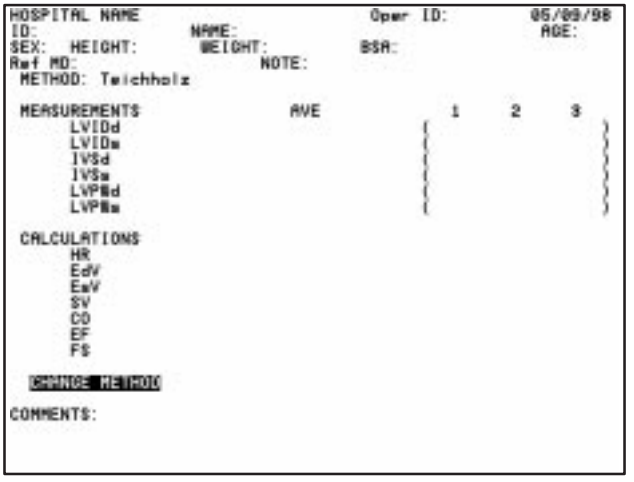


Figure 10–7. Teichholz Report Page Display

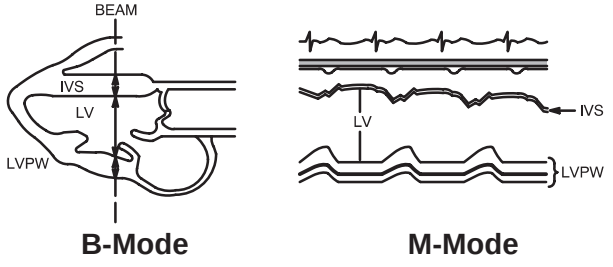


Figure 10–8. Teichholz Methods Measurements

Teichholz Method (cont'd)

Calc Mnemonic	Calc Name	Input Measurements	Formula
LVIDd	Left Ventricular Internal Diameter, Diastole	one distance	LVIDd=d1[cm or mm]
LVIDs	Left Ventricular Internal Diameter, Systole	one distance	LVIDs=d1[cm or mm]
IVSd	Interventricular Septal Thickness, Diastole	one distance	IVSd=d1[cm or mm]
IVSs	Interventricular Septal Thickness, Systole	one distance	IVSs=d1[cm or mm]
LVPWd	Left Ventricle Posterior Wall Thickness, Diastole	one distance	LVPWd=d1[cm or mm]
LVPWs	Left Ventricle Posterior Wall Thickness, Systole	one distance	LVPWs=d1[cm or mm]
EdV	End Diastole Volume	one distance	EdV[ml]=LVIDd^3x7/(2.4 +LVIDd)
EsV	End Systole Volume	one distance	EsV[ml]=LVIDs^3x7/(2.4 +LVIDs)
SV	Stroke Volume	two distances	SV[ml]=EdV–EsV
CO	Cardiac Output	two distances and one 2 beat time interval	CO[1/min]= SVxHR/1000
EF	Ejection Fraction	two distances	EF=SV/EdVx100
FS	Fractional Shortening	two distances	FS=(1–LVIDs/ LVIDd)x100
HR	Heart Rate (beats/minute)	one 2 beat time interval	HR=120[sec]/ 2 beat time[sec]
PHT	Pressure Half Time	one time interval	PHT=t1[ms orsec]
MVA	Mitral Valve Area	one pressure half time interval	MVA[cm^2]= 220/PHT
ET	Ejection Time	one time interval	ET=t1[ms or sec]

Table 10–2. Teichholz Method Formulas

Bullet Method

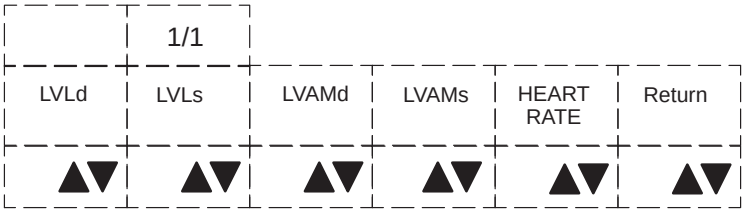


Figure 10–9. Cardiac Calculation Sub-Menu—Bullet Method

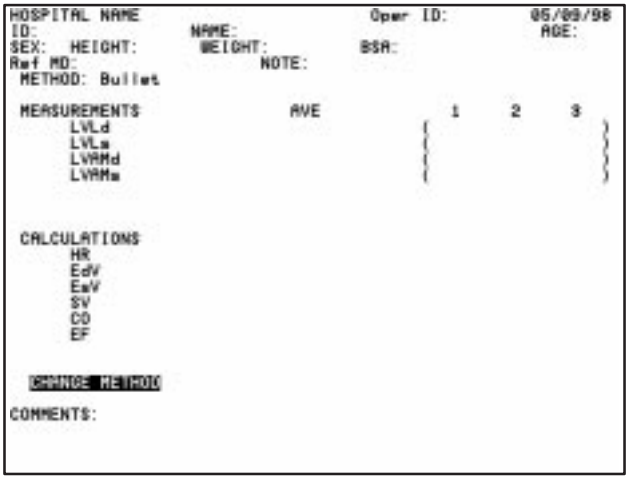


Figure 10–10. Bullet Report Page Display

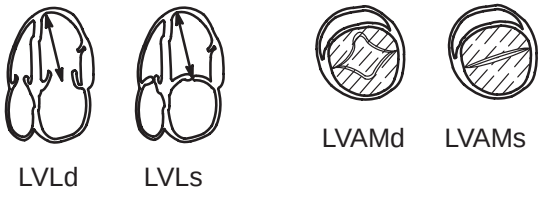


Figure 10–11. Bullet Method Measurements

Bullet Method (cont'd)

Calc Mnemonic	Calc Name	Input Measurements	Formula
LVLd	Left Ventricular Length, Diastole	one distance	LVLd=d1[cm or mm]
LVLs	Left Ventricular Length, Systole	one distance	LVLs=d1[cm or mm]
LVAMd	Left Ventricular Area, Mitral Valve, Diastole	one area (by ellipse, trace or circle)	LVAMd=a1[cm ^2]
LVAMs	Left Ventricular Area, Mitral Valve, Systole	one area (by ellipse, trace or circle)	LVAMs=a1[cm ^2]
EdV	End Diastole Volume	one distance and one area (by ellipse, trace or circle)	EdV[ml]=5xLVLd xLVAMd/6
EsV	End Systole Volume	one distance and one area (by ellipse, trace or circle)	EsV[ml]=5xLVLs xLVAMs/6
SV	Stroke Volume	two distances and two areas (by ellipse, trace or circle)	SV[ml]=EdV–EsV
CO	Cardiac Output	two distances and two areas (by ellipse, trace or circle) and one 2 beat time interval	CO[1/min]=SVxHR/1000
EF	Ejection Fraction	two distances and two areas (by ellipse, trace or circle)	EF=SV/EdVx100
HR	Heart Rate (beats/minute)	one 2 beat time interval	HR[BPM]=120 [sec]/ 2 beat time [sec]
PHT	Pressure Half Time	one time interval	PHT=t1[ms orsec]
MVA	Mitral Valve Area	one pressure half time interval	MVA[cm^2]= 220/PHT
ET	Ejection Time	one time interval	ET=t1[ms or sec]

Table 10–3. Bullet Method Formulas

Modified Simpson's Rule Method

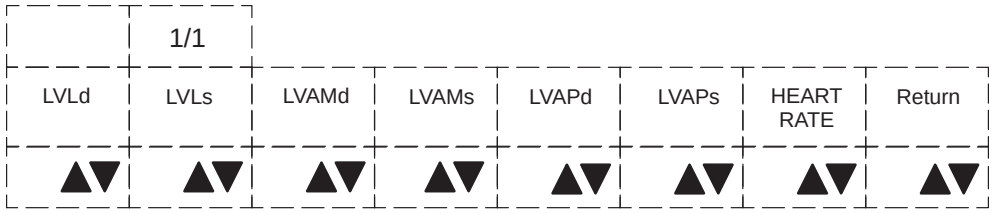


Figure 10–12. Cardiac Calculation Sub-Menu—Modified Simpson's Rule Method

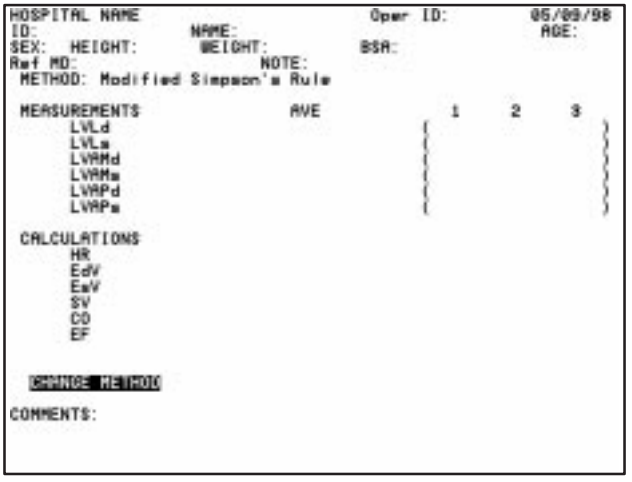


Figure 10–13. Modified Simpson's Rule Report Page Display

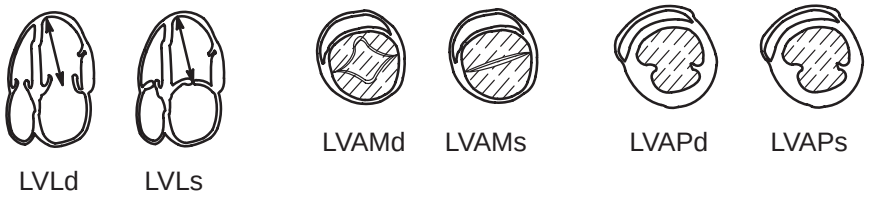


Figure 10–14. Modified Simpson's Rule Method Measurements

Modified Simpson's Rule Method (cont'd)

Calc Mnemonic	Calc Name	Input Measurements	Formula
LVLd	Left Ventricular Length, Diastole	one distance	LVLd=d1[cm or mm]
LVLs	Left Ventricular Length, Systole	one distance	LVLs=d1[cm or mm]
LVAMd	Left Ventricular Area, Mitral Valve, Diastole	one area (by ellipse, trace or circle)	LVAMd=a1[cm ^2]
LVAMs	Left Ventricular Area, Mitral Valve, Systole	one area (by ellipse, trace or circle)	LVAMs=a1[cm ^2]
LVAPd	Left Ventricular Area, Papillary Muscles, Diastole	one area (by ellipse, trace or circle)	LVAPd=a1[cm ^2]
LVAPs	Left Ventricular Area, Papillary Muscles, Systole	one area (by ellipse, trace or circle)	LVAPs=a1[cm ^2]
EdV	End Diastole Volume	one distance and two areas (by ellipse, trace or circle)	EdV[ml]=LVLd/3 x(LVAMd+(LVAMd+ LVAPd)/2+ LVAPd/3)
EsV	End Systole Volume	one distance and two areas (by ellipse, trace or circle)	EsV[ml]=LVLs/3 x(LVAMs+(LVAMs+ LVAPs)/2+ LVAPs/3)
SV	Stroke Volume	two distances and four areas (by ellipse, trace or circle)	SV[ml]=EdV–EsV
CO	Cardiac Output	two distances and four areas (by ellipse, trace or circle) and one 2 beat time interval	CO[1/min]= SVxHR/1000
EF	Ejection Fraction	two distances and four areas (by ellipse or trace or circle)	EF=SV/EdVx100
HR	Heart Rate (beats/minute)	one 2 beat time interval	HR=120[sec]/ 2 beat time[sec]
PHT	Pressure Half Time	one time interval	PHT=t1[ms orsec]
MVA	Mitral Valve Area	one pressure half time interval	MVA[cm^2]= 220/PHT
ET	Ejection Time	one time interval	ET=t1[ms or sec]

Table 10–4. Modified Simpson's Rule Method Formulas

Single Plane Ellipsoid Method

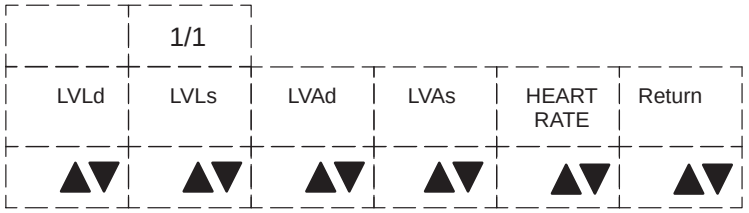


Figure 10–15. Cardiac Calculation Sub-Menu—Single Plane Ellipsoid Method

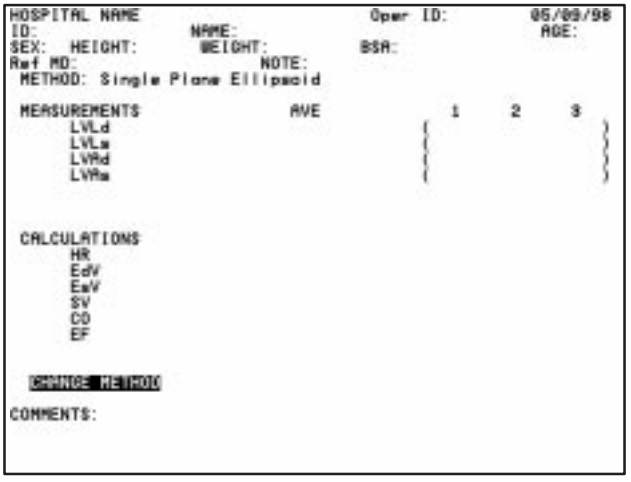


Figure 10–16. Single Plane Ellipsoid Report Page Display

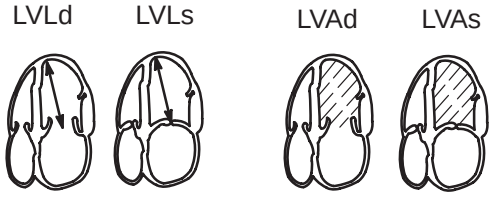


Figure 10–17. Single Plane Ellipsoid Method Measurements

Single Plane Ellipsoid Method (cont'd)

Calc Mnemonic	Calc Name	Input Measurements	Formula
LVLd	Left Ventricular Length, Diastole	one distance	LVLd=d1[cm or mm]
LVLs	Left Ventricular Length, Systole	one distance	LVLs=d1[cm or mm]
LVAd	Left Ventricular Area, Diastole	one area (by ellipse, trace or circle)	LVAd=a1[cm ^2]
LVAs	Left Ventricular Area, Systole	one area (by ellipse, trace or circle)	LVAs=a1[cm ^2]
EdV	End Diastole Volume	one distance and two areas (by ellipse, trace or circle)	EdV[ml]=8/(3 π) x(LVAd)^2/LVLd
EsV	End Systole Volume	one distance and two areas (by ellipse, trace or circle)	EsV[ml]=8/(3 π) x(LVAs)^2/LVLs
SV	Stroke Volume	two distances and four areas (by ellipse, trace or circle)	SV[ml]=EdV–EsV
CO	Cardiac Output	two distances and four areas (by ellipse, trace or circle) and one 2 beat time interval	CO[1/min]=SVxHR/1000
EF	Ejection Fraction	two distances and four areas (by ellipse, trace or circle)	EF=SV/EdVx100
HR	Heart Rate (beats/minute)	one 2 beat time interval	HR[BPM]=120 [sec]/ 2 beat time [sec]
PHT	Pressure Half Time	one time interval	PHT=t1[ms orsec]
MVA	Mitral Valve Area	one pressure half time interval	MVA[cm^2]= 220/PHT
ET	Ejection Time	one time interval	ET=t1[ms or sec]

Table 10–5. Single Plane Ellipsoid Method Formulas

Bi Plane Ellipsoid Methods

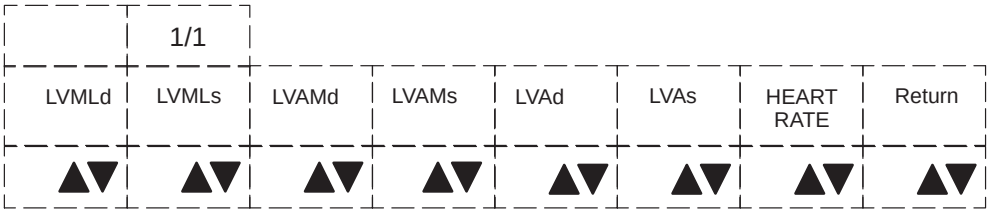


Figure 10–18. Cardiac Calculation Sub-Menu—Bi Plane Ellipsoid Method

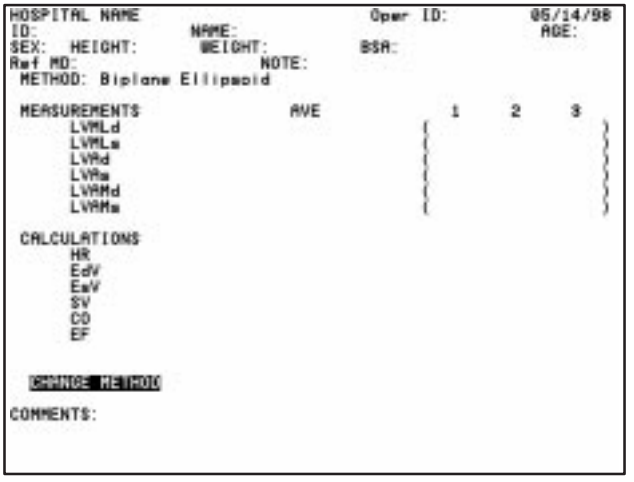


Figure 10–19. Bi Plane Ellipsoid Report Page Display

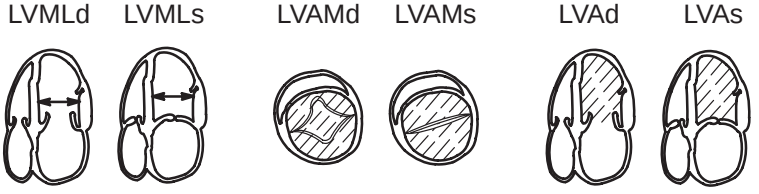


Figure 10–20. Bi Plane Ellipsoid Methods Measurements

Bi Plane Ellipsoid Method (cont'd)

Calc Mnemonic	Calc Name	Input Measurements	Formula
LVMLd	Left Ventricle Medial-Lateral Dimension, Diastole	one distance	LVMLd=d1[cm or mm]
LVMLs	Left Ventricle Medial-Lateral Dimension, Systole	one distance	LVMLs=d1[cm or mm]
LVAMd	Left Ventricular Area, Mitral Valve, Diastole	one area (by ellipse, trace or circle)	LVAMd=a1[cm ^2]
LVAMs	Left Ventricular Area, Mitral Valve, Systole	one area (by ellipse, trace or circle)	LVAMs=a1[cm ^2]
LVAd	Left Ventricle Area, Diastole	one area (by ellipse, trace or circle)	LVAd=a1[cm ^2]
LVAs	Left Ventricle Area, Systole	one area (by ellipse, trace or circle)	LVAs=a1[cm ^2]
EdV	End Diastole Volume	one distance and two areas (by ellipse, trace or circle)	EdV[ml]=8/(3 π) x(LVAdxLVAMd)/ LVMLd
EsV	End Systole Volume	one distance and two areas (by ellipse, trace or circle)	EsV[ml]=8/(3 π) x(LVAsxLVAMs)/ LVMLs
SV	Stroke Volume	two distances and four areas (by ellipse, trace or circle)	SV[ml]=EdV–EsV
CO	Cardiac Output	two distances and four areas (by ellipse, trace or circle) and one 2 beat time interval	CO[1/min]=SVxHR/1000
EF	Ejection Fraction	two distances and four areas (by ellipse, trace or circle)	EF=SV/EdVx100
HR	Heart Rate (beats/minute)	one 2 beat time interval	HR[BPM]=120 [sec]/ 2 beat time [sec]
PHT	Pressure Half Time	one time interval	PHT=t1[ms orsec]
MVA	Mitral Valve Area	one pressure half time interval	MVA[cm^2]=220/PHT
ET	Ejection Time	one time interval	ET=t1[ms or sec]

Table 10–6. Bi Plane Ellipsoid Method Formulas

Additional Cardiology Calculations

Volume

The volume calculation can be made from 1, 2 or 3 distances, from 1 distance and an ellipse, from a single ellipse or from 2 ellipse measurements.

General Measurements and Calculations details how to make distance and ellipse measurements.

IMPORTANT NOTE: When a volume calculation is desired, the necessary measurements or combination of measurements must be made BEFORE selecting VOLUME in the Sub-menu.

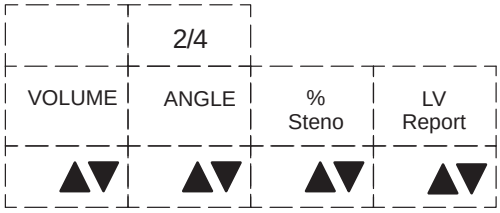


Figure 10–21. Cardiac Calculation Sub-Menu

Examples

When a volume calculation is desired, do one of the following:

- Make 1 distance measurement.
- Make 2 distance measurements.
- Make 1 ellipse measurement.
- Make 3 distance measurements.

NOTE: Three distances should be done in the dual format mode (side by side images). One measurement is usually made in the sagittal plane and 2 measurements in the axial plane.

- Make 1 distance and 1 ellipse measurement.
- Make 2 ellipse measurements.

Formulas used are found in the table on *10–21*.

Hints

- Volumes are most accurate when measurements are taken in the sagittal and axial scan planes.
- Use the side by side dual format option to display sagittal and axial plane images simultaneously.
- Make all necessary measurements before selecting volume.
- See *General Measurements and Calculations* for details on the steps to take when doing basic distance and area measurements.
- An overflow error message (OOR) will occur during a 2 ellipse, or 1 ellipse/1 distance volume calculation if: the minor (small) axis of the large ellipse is equal to/less than the major (large) axis of the small ellipse (d1), or equal to/less than the single distance measurement (d2).

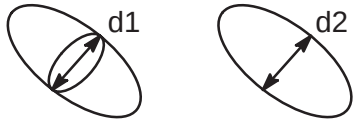


Figure 10–22. Volume Calculation Error Possibilities

Volume Calculation Formulas

Calc Name	Input Measurements	Formula
Volume (spherical)	one distance	Vol[ml]=(π/6)xd^3
Volume (prolate spheroidal)	two distances, d1>d2	Vol[ml]= (π/6)xd1xd2^2
Volume (prolate spheroidal)	one ellipse, d1 major axis, d2 minor axis	Vol[ml]= (π/6)xd1xd2^2
Volume (spheroidal)	three distances	Vol[ml]= (π/6)xd1xd2xd3
Volume (spheroidal)	one distance d1, one ellipse, d2 major axis, d3 minor axis	Vol[ml]= (π/6)xd1xd2xd3
Volume (spheroidal)	two ellipse, ellipse 1 with axes d1 and d2, ellipse 2 with axes d3 and d4, with $\|d2–d3\| \leq \|d1–d4\|$ and d2>d3	Vol[ml]= (π/6)xd1xd2xd4 (d3 is not used, assuming it is close to d2)

Table 10–7. Volume Calculation Formulas

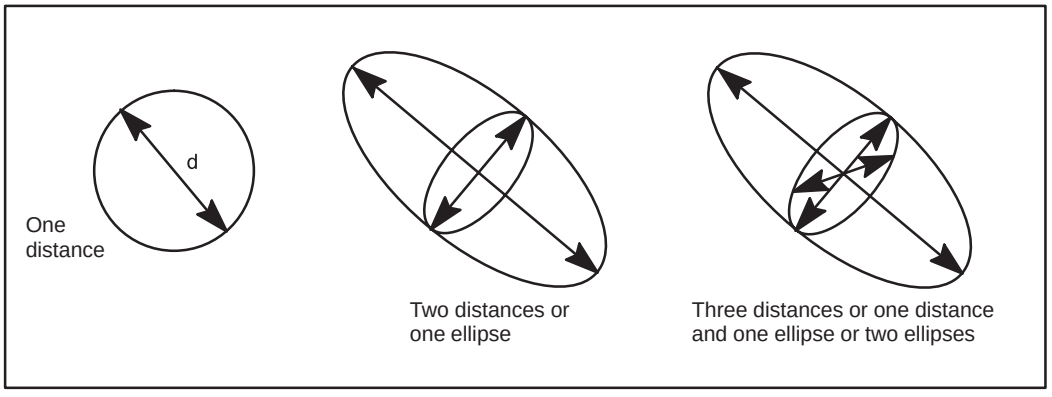


Figure 10–23. Volume Calculation Examples

Angle

This function is intended to measure the angle between 2 intersecting planes:

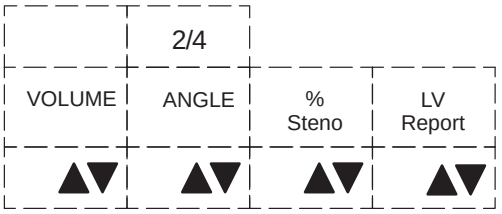
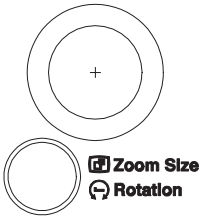
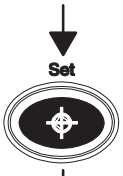


Figure 10–24. Cardiac Calculations Sub-Menu

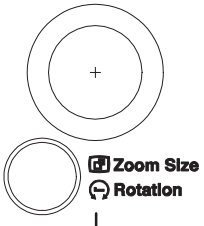
Select **ANGLE** from the Calculations Sub-Menu. A "×" cursor with a vertical dashed line appears. The displayed angle is zero degrees.



Use the **Trackball** to position the line cursor and the **Zoom Size/Rotation** control to adjust the angle of the line cursor.



Press **Set** to fix the position of the first cursor.



Use the **Trackball** to position the second line cursor and the **Zoom Size/Rotation** control to adjust the angle of the second line cursor. The angle between the 2 cursors is constantly updated on the display.

(continued)

Angle (cont'd)

If a fine adjustment of the 2 cursors is needed, press **Measurement** to toggle which line cursor is active. Adjust the active cursor with the **Trackball** and **Zoom Size/Rotation** control.

Press **Set** to complete the angle measurement.

% Stenosis (stenosis ratio)

To calculate percent stenosis in a B-Mode image:

The area of the blood vessel can be measured by the ellipse, trace, circle, 2 distance or 1 distance methods. See *General Measurements and Calculations* for details on the steps to take when doing basic distance and area measurements. The Set Up/Preset Program page 3 defines the default method.

Select **% Steno** in the Calculations Sub-Menu.

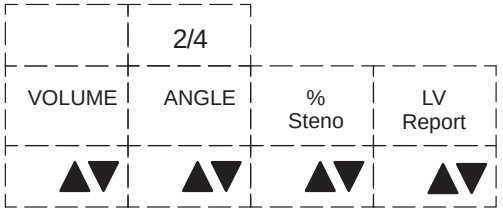


Figure 10–25. Cardiac Calculations Sub-Menu

The first cursor is the residual area of the blood vessel and the second cursor is the lumen area of the blood vessel.

CAUTION

When using a distance measurement to calculate area for % stenosis, the measurement should always be taken from a cross sectional view of the vessel.

Do NOT take a distance measurement from a longitudinal view for an area calculation. This may lead to an inaccurate assessment of % stenosis.

PHT (Pressure Half Time)

A PHT measurement is used to calculate Mitral Valve Area (MVA). The measurement is taken on the Doppler spectral display of the mitral valve.

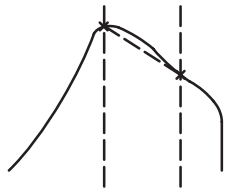


Figure 10–26. PHT Measurement on Mitral Valve Waveform

Select **PHT** from of the Calculation Sub-Menu. Perform a time interval measurement as described *7–18*. Set the first cursor on the peak of the mitral valve waveform and the second on to a point halfway down the mitral valve waveform slope.

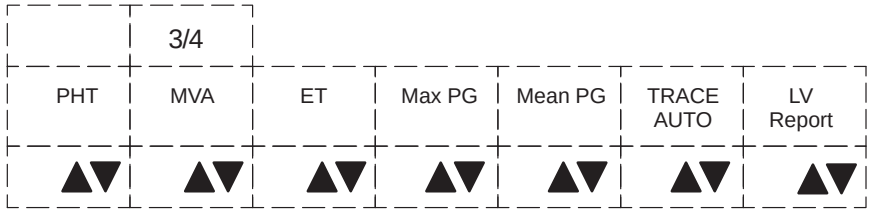


Figure 10–27. Cardiac Calculation Sub-Menu

MVA (Mitral Valve Area)

A Mitral Valve Area is calculated from the pressure half time measurement. If PHT was selected, MVA is also calculated. If MVA is selected, PHT must be measured in order to calculate MVA.

ET (Ejection Time)

Ejection time for the left ventricle is the time during which the aortic valve is open. It is measured on a Doppler Spectrum display. The time between the two cursors is ejection time (ET).

Figure 10–28. Ejection Time for Aortic Valve

Select **ET** from of the Calculation Sub-Menu. Perform a time interval measurement as described on *7–18*. Set the first cursor at the opening of the aortic valve and the second at the closing of the aortic valve.

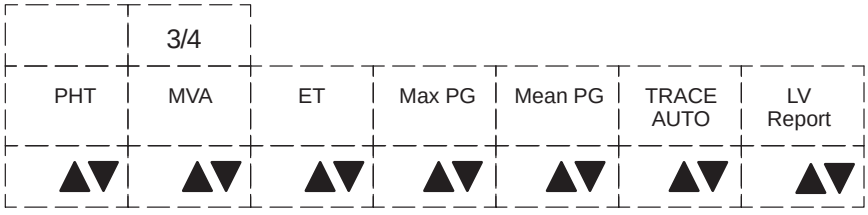


Figure 10–29. Cardiac Calculation Sub-Menu

Max PG

To measure MAX PG (Maximum Pressure Gradient):

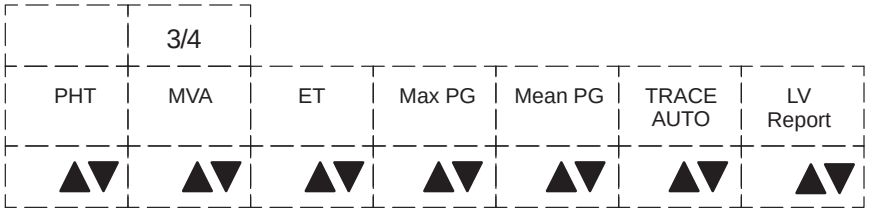


Figure 10–30. Cardiac Calculations Sub-Menu

Select **MAX PG** from the Calculations Sub-Menu. Perform peak velocity measurements as described on *7–14*. Set the first cursor on V_{MAX} and the second on Vd.

Automatic Calculation of Max PG

If velocity was previously measured and calculated in Doppler Mode, MAX PG is calculated from the V_{MAX} and Vd measurements taken for velocity when MAX PG is first selected in the Calculation Sub-Menu.

Mean PG

To measure Mean PG (Mean Pressure Gradient):

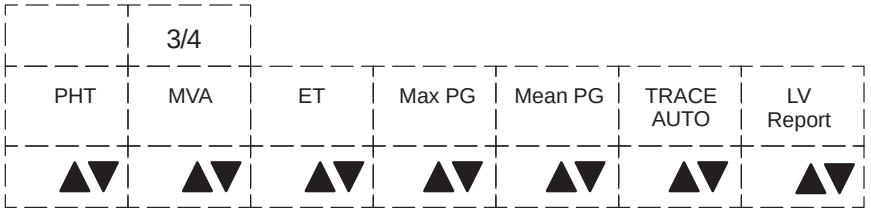


Figure 10–31. Cardiac Calculation Sub-Menu

Select **MEAN PG** from the Calculation Sub-Menu. Perform the measurement described on *7–15*. Set the first cursor on the waveform trace starting point.

If Trace Auto is selected, the waveform is automatically traced after the second cursor is fixed.

If Trace Auto is not selected, manually trace the desired portion of the waveform.

Press **Set** to complete the the Mean PG measurement.

Automatic Calculation of Mean PG

If velocity was previously measured and calculated in Doppler Mode, Mean PG is calculated from the velocity value when Mean PG is first selected in the Calculation Sub-Menu.

The waveform is automatically traced. Velocity and Mean PG are also displayed on the screen.

Trace Auto

To turn Doppler Auto Trace on or off:

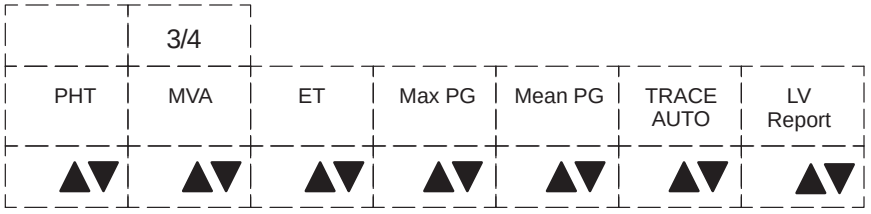


Figure 10–32. Cardiac Calculation Sub-Menu

Select **TRACE AUTO** from the Calculation Sub-Menu.

Use the Trace Auto Sub-Menu selection to turn on/off the Doppler Auto Trace function.

If Trace Auto is highlighted, the Doppler envelope will automatically be traced as determined by parameters set in Custom Display page 13 and Preset Program page 7.

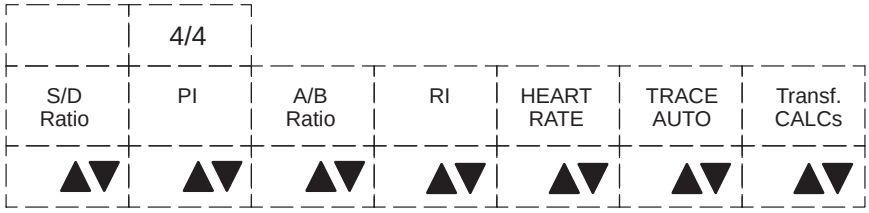
If Trace Auto is not highlighted, the Auto Trace function is off and traces can be performed manually.

Trace Method

The system will trace the peak value, floor and peak, mean and peak or mode and peak, depending on the method selected by the user.

S/D (D/S) Ratio, RI, A/B Ratio or PI

To measure the systolic/diastolic (diastolic/systolic) ratio, resistance index, velocity ratio and pulsatility index:



Transf CALCS is only available with Realtime Doppler Calculation option installed

Figure 10–33. Cardiac Calculation Sub-Menu

Select **S/D (D/S) RATIO, RI**, **A/B RATIO** or **PI** from the Calculations Sub-Menu. Perform peak velocity measurements as described on *7–14*.

The first cursor is the start point on the Doppler waveform. This would be systole for S/D ratio (diastole for D/S ratio), peak velocity for RI, “A” velocity for A/B ratio and V_{MAX} for PI.

The second cursor is the end-point cursor to the end point of the Doppler waveform. This would be diastole for S/D ratio (systole for D/S ratio), minimum velocity for RI, “B” velocity for A/B ratio and Vd for PI.

NOTE: For the PI calculation, if Trace Auto is not selected, manually trace the waveform between V_{MAX} and Vd.

If 2 velocity measurements are made prior to selecting S/D (D/S) ratio, A/B ratio or RI, the system automatically calculates S/D (D/S) ratio, A/B ratio or RI from the last two velocity measurements recorded.

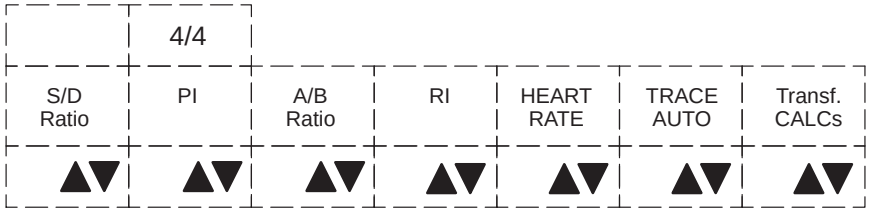
*NOTE: For the PI calculation, if Trace Auto is on, the system automatically traces the waveform when **Set** is pressed to fix Vd.*

Hints

With S/D (D/S), PI and RI, if “Vd” is selected as the diastole velocity in Preset Program page 4, the end point is defined as Vd if Trace Auto is OFF.

Heart Rate (HR)

To calculate the Heart Rate:



Transf CALCS is only available with Realtime Doppler Calculation option installed

Figure 10–34. Cardiac Calculations Sub-Menu

Select **HEART RATE** from the Calculations Sub-Menu. Measure the time between two heartbeats.

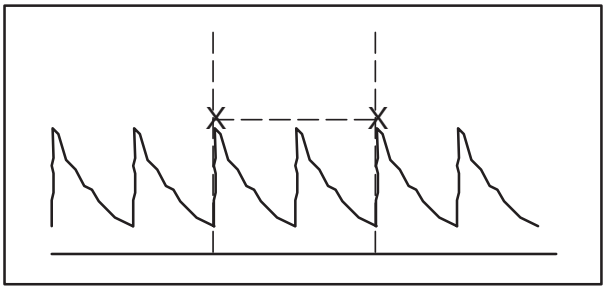


Figure 10–35. Two Heart Beat Reference

*NOTE: **Set** must be pressed to complete the measurement. Otherwise, the calculation does not transfer to the Report Page.*

Transf Calcs

This selection is only available if the Realtime Doppler Calculation option is installed and Realtime Doppler Calculations are displayed in the upper left corner of the screen. See the Advanced Options chapter of the *Advanced Reference Manual* for details on Realtime Doppler operation.

ECG Option

Overview

A physiological input panel is available for the LOGIQ™ 400. This panel has inputs for ECG, physiological and auxiliary signals.

The ECG Soft-Menu controls the signals connected to the Physiological panel.

Approved accessory cables provide the proper signals to the Physiological Panel.

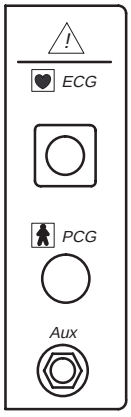


Figure 10–36. Optional Physiological Input Panel

NOTE: The LOGIQ™ 400 can calculate heart rate in BPM from the ECG waveform. See Set Up/Custom Display page 17 to turn ECG Heart Rate Display on or off.

WARNING Do not use with defibrillator.

Physio Sweep Speed

The sweep speed of the physio signal on the B-Mode image can be set independent of the timeline (M-Mode and Doppler) sweep speed.

This is accomplished using the preset parameter “Physio Sweep Speed on B”. It is found on Set Up/Custom Display page 3.

ECG Sub-Menu

The 3 pages of the ECG Sub-Menus provide for control of the physiological input signals. In each case, select the proper sub-menu page by pressing the **Sub-Menu Select** up/down arrow keys.

ECG Lead Placement

The 3 patient ECG leads are color coded white, black and green.

White is connected to the patient's right arm, black to the left arm, and green (ground) to the right foot (often placed on the right side of the abdomen). The right arm connection may change if the patient is in the decubitus position. Refer to Figure 10–37.

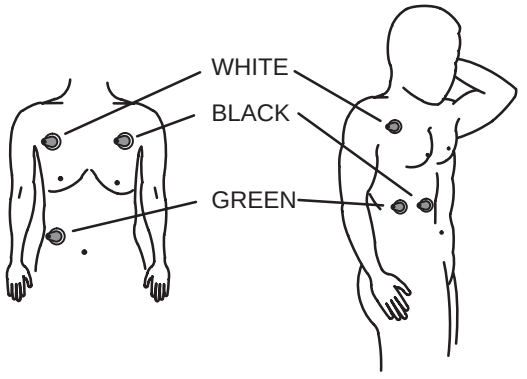


Figure 10–37. Common ECG Lead Placement

Once the leads are connected to the patient and the LOGIQ™ 400, the ECG waveform amplifier needs about 10 seconds to stabilize the waveform on the CRT before adjustments are made.

ECG Sync Mark Display

A flashing heart can be displayed as a R-wave sync mark when a valid ECG trace is present. It can be turned on or off in Set Up/Custom Display page 17. This sync mark is added after system memory. Therefore, it will not be able to be recalled during cine review.

ECG Sub-Menu Page 1

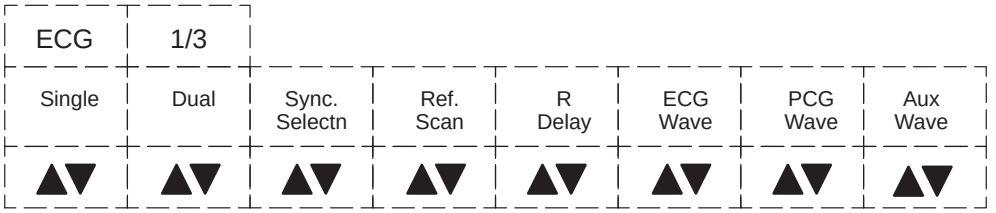


Figure 10–38. ECG Sub-Menu Page 1

	Single	Dual
Description	Updates the B-Mode image at the R1 time. Each time the R1 point is reached on the ECG, PCG, or AUX Waveform, the B-Mode image changes. In between R1 trigger points, the B-Mode image is frozen. The display shows the delay value as S1.	Updates the B-Mode image at the R1 and R2 times. Each time the R1 and R2 points are reached on the ECG, PCG, or Aux waveform, the B-Mode image changes. In between each trigger time, the B-Mode image is frozen. *NOTE: R_2 on the ECG will be marked with a vertical dotted line. The display shows the delays as S1 and S2.*
Benefits	Allows for the acquisition of an image at a specific point in the Cardiac Cycle.	Allows for the acquisition of an image at two points in the Cardiac Cycle.
Values	If Single is highlighted, the one-trigger function is on. If Single is not highlighted, the function is off. *NOTE: The Trackball can be used to change the value of the active delay.*	If Dual is highlighted, the two-trigger function is on. If Dual is not highlighted, the two-trigger function is off. *NOTE: The Trackball can be used to change the value of the active delay.*
Affects on Other Controls	If Dual was highlighted when single is pressed, the Dual function is turned off and the Single function turned on.	If Single is highlighted when Dual is pressed, the single function is turned off and the Dual function turned on.

ECG Sub-Menu Page 1

	Sync Selectn	Ref Scan (Reference Scan)
Description	In the Single trigger mode, Sync Selection allows for the choice of triggering on R1 or R2. In the Dual trigger mode, Sync Selection toggles trackball control of the S1 or S2 delays displayed in the upper left corner of the monitor.	Reference Scan provides the ability to display both an active and trigger updated image simultaneously in the Dual B-Mode display format. Reference Scan functions in the Single trigger Mode only. A real-time image can not be obtained in Dual Trigger Mode. In dual image mode, press **Left** to display a trigger updated image on the left and active image on the right. Press **Right** to display a trigger updated image on the right and active image on the left.
Benefits	Provides trackball control of delay and selection of update trigger point.	Provides the ability to view the real-time image while simultaneously acquiring images at a trigger point on the ECG, PCG or Aux waveform. These images are best recorded on video tape.
Values	R1 or R2 trigger select or variable delay adjustment.	The Reference Scan function is on when the Sub-Menu selection is highlighted. The function is off when the Sub-Menu selection is not highlighted. *NOTE: The real-time image will only update at each trigger point. The image is paused between the trigger points.*
Affects on Other Controls	Changes trigger point in Single Trigger Mode. Changes Trackball control of delays in Dual Mode.	

	R Delay	ECG Wave, PCG Wave, Aux Wave
Description	R Delay assigns Trackball Control to the adjustment of the trigger delays for R1(S1) or R2 (S2). The graphic display of the delay is found in the upper left corner of the monitor.	These 3 menu selections provide the ability to turn each waveform on for display on the monitor.
Benefits	Allows for the easy adjustment of the R1 (S1) or R2 (S2) delays while scanning.	Allows for the choice to display a waveform.
Values	When R Delay is highlighted, the Trackball controls the adjustment of the delays. If R Delay is not highlighted, the delays cannot be adjusted with the Trackball. *NOTE: R Delay is automatically activated when SINGLE or DUAL trigger modes are selected.*	On or Off.

ECG Gain Pages 2 and 3

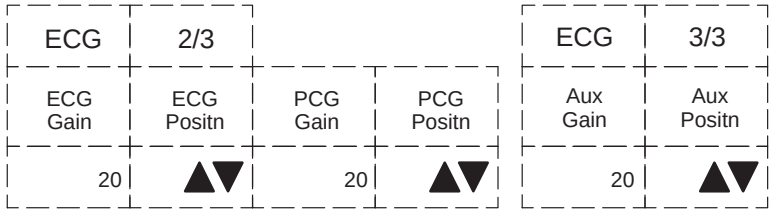


Figure 10–39. ECG Sub-Menus Pages 2 and 3

	ECG Gain, PCG Gain, Aux Gain	ECG Positn, PCG Positn, Aux Positn (Position)
Description	Allows for the amplitude control of the ECG, PCG or Aux waveform.	Allows for the vertical positioning of the ECG, PCG or Aux waveform on the image display.
Benefits	Allows for amplitude adjustment to compensate for different levels of ECG, PCG or Aux output.	Allows for positioning of the ECG, PCG or Aux waveform to minimize impact on the scan image. Adjustable to user requirements.
Values	The PCG & AUX gain can be adjusted from –10 to +10 in 2-digit increments. EGC gain can be adjusted from –20 to +10 in 2-digit increments. *NOTE: ECG, PCG and Aux default gain setting can be changed in the Set Up Custom Display menu page 17.*	Changes display position of the waveform. *NOTE: ECG, PCG and Aux default position can be changed in the Set Up Custom Display menu page 17.*

ECG/Cine Gauge/Image Tracking

When an ECG waveform is displayed with the cine gauge, an arrow pointer will appear above the ECG waveform.

As the cine gauge marker is moved with the Cine Scroll control, the arrow above the ECG waveform will move to indicate where on the ECG cycle the displayed image was taken.

Advanced Cardiac Calculations

(AMCAL option)

Overview

This option provides additional measurement, calculation and report capabilities to the Left-Ventricular calculations not found in the basic cardiac option package.

Added to the basic package is the Gibson, Single Plane–DISC and Bi-Plane–DISC methods of LV calculations. Additional scan mode measurement categories are:

B-Mode	Parasternal Long Axis (PLAX), Parasternal Short Axis (PSAX) Aortic Valve, PSAX Mitral Valve, PSAX Papillary Muscles, Apical 4 chamber, Apical 2 chamber
M-Mode	Left/Right Ventricles, Mitral Valve, Aortic Valve, Pulmonic Valve, Tricuspid Valve
D-Mode	Mitral Valve, Aortic Valve, Pulmonic Valve, Tricuspid Valve

NOTE: If the Doppler option is not installed with the LOGIQ™ 400 Black/White systems, the Doppler Mode measurements cannot be performed.

Refer to the *Advanced Reference Manual* for further details.

Exam Preparation

Introduction

Measurements and calculations derived from ultrasound images are intended to supplement other clinical procedures available to the attending physician. The accuracy of measurements is not only determined by the system accuracy, but also by use of proper medical protocols by the user. When appropriate, be sure to note any protocols associated with a particular measurement or calculation. Formulas and databases used within the system software that are associated with specific investigators are so noted. Be sure to refer to the original article describing the investigator's recommended clinical procedures.

General Guidelines

Any measurement can be repeated by selecting that measurement again from the Sub-Menu.

The system will retain as many as 8 measurements, but the summary report retains only the last 3 measurements of each type.

The 3 report page measurements can be averaged and the average used in other calculations.

Measurements

Carotid Artery Measurements

Page 1 of the Vascular Sub-Menu contains measurements for the patient's right side. Page 2 of the Sub-Menu contains identical left side measurements.

NOTE: If the Doppler option is not installed with the LOGIQ™ 400 Black/White systems, the Doppler Mode measurements cannot be performed.

ECA, CCA, Bifurc and ICA

To measure the velocity of the blood through the right/left external carotid artery, common carotid artery, carotid artery bifurcation or internal carotid artery in the Doppler spectrum:

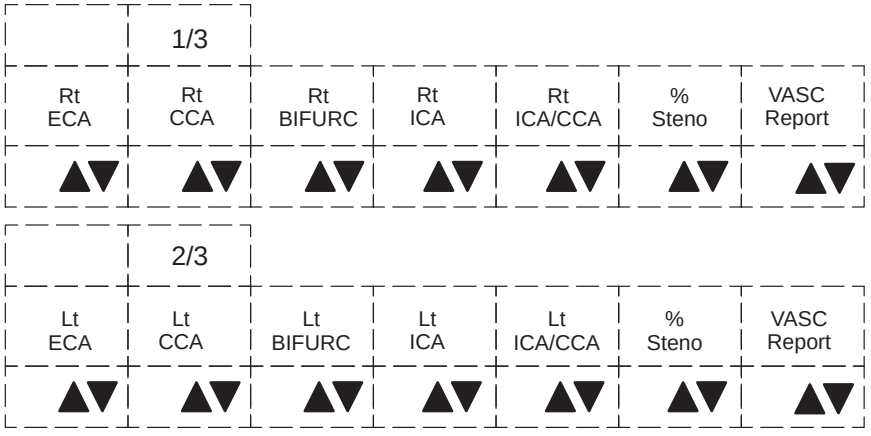


Figure 11–1. Vascular Calculation Sub-Menu

Image the appropriate artery. Select the desired measurement from the Vascular Calculation Sub-Menu. The calculation mode is set and a "×" cursor with a vertical dotted line appears.

Move the cursor to the desired position on the Doppler spectrum and press **Set**. The velocity measurement is completed and recorded on the Vascular Summary Report.

RT (LT) ICA/CCA

To calculate a velocity ratio between the right (left) Internal carotid artery and common carotid artery:

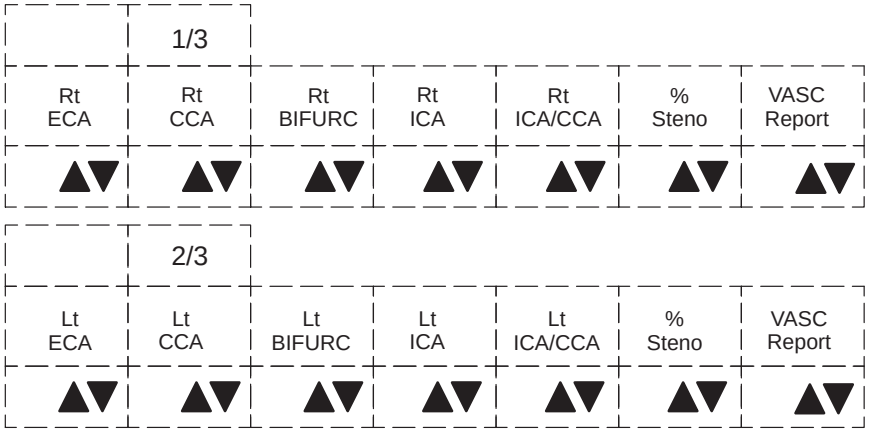


Figure 11–2. Vascular Calculation Sub-Menus

Image the left or right internal carotid artery first. Select **RT ICA/CCA** from page 1 or **LT ICA/CCA** from page 2 of the Vascular Calculation Sub-Menu.

Move the cursor to the peak point of the Internal carotid artery Doppler spectrum and press **Set**.

Image the common carotid artery and press **Freeze**.

Press the **Measurement** key.

Move the cursor to the peak point (velocity) on the Doppler spectrum of the common carotid artery and press **Set**. The ICA/CCA calculation is complete and a calculated value is displayed.

NOTE: If individual ICA and CCA measurements were already made, the ICA/CCA will be automatically calculated from previous measurements.

Stenosis Ratio (% stenosis)

Refer to the procedure found on *10–23*.

S/D (D/S) Ratio, RI, A/B Ratio or PI

Refer to the procedure found on *10–29*.

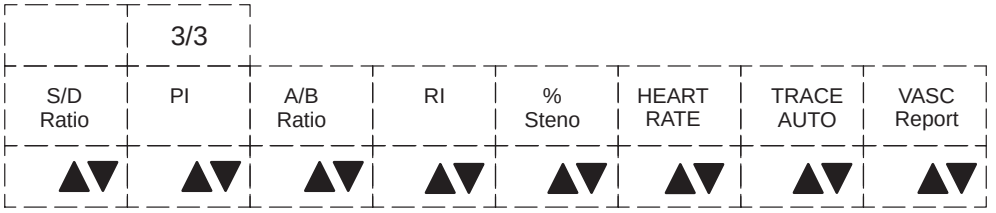


Figure 11–3. Vascular Calculation Sub-Menu

Heart Rate (HR)

Refer to the procedure found on *10–30*.

Trace Auto

Use the Trace Auto Sub-Menu selection to turn on/off the Doppler Auto Trace function. See *10–28* for more details.

Helpful Hints

Hints

If there is a series of measurements/calculations that are routinely taken in a specific sequence, the auto sequence feature of the system can be used to program these measurements/calculations to automatically appear on the display in the desired order. Refer to *14–79* for details on programming an auto sequence.

Vascular Summary Report

Introduction

The vascular summary report is structured to automatically display vascular measurements made at specific anatomical sites. An average of the 3 measurements can also be displayed. Calculated ratios are automatically summarized and displayed.

Displaying the Summary Report

The summary report can be displayed at any time during the exam by selecting **VASC REPORT** from the Vascular Calculation Sub-Menu.

Data entered as new patient data is automatically summarized at the top of the summary report. Measurements are summarized below the patient data. Calculations and ratios appear at the bottom of the summary report.

To exit the summary report display and resume scanning, select **VASC REPORT** from the Sub-Menu to deactivate it.

Displaying the Summary Report (cont'd)

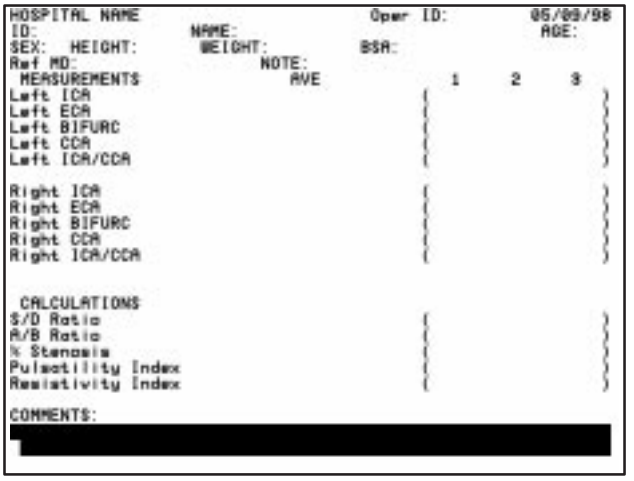


Figure 11–4. Vascular Report Page

<AVG> or <LAST> indicates that the Average or Latest value will be displayed in this column. This depends on the preset, *Average Activity*, in the Set Up/Preset Program menu page 3.

Editing the Summary Report

New patient data cannot be edited. Measurements can be edited by the operator.

To edit a measurement:

Select **VASC REPORT** from any page of the Vascular Calculation Sub-Menu.

Use the **Trackball** or **Return** key to move the cursor to the measurement that is to be edited. The measurement can be deleted by pressing the **BackSpace** or **Space** bar and then **Set**.

The average measurements, calculations and ratios are automatically updated to reflect the edited values.

When editing is complete, select **Exit** to leave the summary report and resume imaging.

Recording Summary Reports

The summary report can be saved like any ultrasound image. Once it is displayed on the screen, it can be recorded on the VCR, printed on the B/W or color page printer, photographed by the multi-image camera, stored on a MOD with the Image Archive option or placed on regular paper with a line printer.

Line Printer Operation

USA Only

Refer to *13–15* for details on line printer operation.

Vascular Calculation Formulas

Calc Mnemonic	Calc Name	Input Measurements	Formula
RT ECA	Right External Carotid Artery Velocity	one Doppler blood flow peak velocity	RT ECA=v1 [cm/s or m/s]
RT CCA	Right Common Carotid Artery Velocity	one Doppler blood flow peak velocity	RT CCA=v1 [cm/s or m/s]
RT BIFURC	Right Carotid Bifurcation Velocity	one Doppler blood flow peak velocity	RT BIFURC=v1 [cm/s or m/s]
RT ICA	Right Internal Carotid Artery Velocity	one Doppler blood flow peak velocity	RT ICA=v1 [cm/s or m/s]
RT ICA/CCA	Right Internal Carotid Artery Velocity/Common Carotid Artery Velocity Ratio	two Doppler blood flow peak velocities	RT ICA/CCA=V_{ICA}/V_{CCA}
LT ECA, LT CCA, LT BIFURC, LT ICA, LT ICA/CCA	Same as above, for Left Carotid Artery	Same as above	Same as above
A/B Ratio	Velocities Ratio	two Doppler blood flow peak velocities	A/B=V_1/V_2
% Stenosis	Stenosis Ratio	two areas (by ellipse, trace, circle or distance)	% Stenosis=[1–($A_{residual}/A_{lumen}$)]x100
S/D Ratio	Systolic Velocity/Diastolic Velocities Ratio	two Doppler blood flow peak velocities	S/D=$V_{systole}/V_{diastole}$ *NOTE*
PI	Pulsatility Index	two Doppler blood flow peak velocities and TAMAX	PI=(V_{max}–$V_{diastole}$)/ TAMAX *NOTE*
RI	Resistivity Index	two Doppler blood flow peak velocities	RI=(V_{max}–$V_{diastole}$)/ V_{max} *NOTE*
HR	Heart Rate (beats/minute)	one 2 beat time interval (measured manually or automatically)	HR[BPM]=120[sec]/ 2beat time[sec]

NOTE: $V_{diastole} = V_{min}$ or $V_{end–diastole}$

Table 11–1. Vascular Calculation Formulas

Advanced Vascular
(software option)

Overview

The Advanced Vascular software option provides increased measurement and reporting capabilities for vascular and venous studies.

NOTE: If the Doppler option is not installed with the LOGIQ™ 400 Black/White systems, the Doppler Mode measurements cannot be performed.

Menu Selections

The Advanced Vascular menu selections offer more flexibility than the Basic Software package.

In the Advanced Menus, the user can select

- left/right side on menu page 1.
- 3 Doppler sites on page 3.
- 3 stenosis sites on page 4.

Each Doppler and Stenosis site can be edited (5 characters maximum) on the Vascular Report pages.

The menus displayed will depend on the preset for determination of systole/diastole (auto/manual) in the Set Up/ Preset Program page 3.

Refer to the *Advanced Reference Manual* for further details.

Urology Basic Calculations

Overview

The Urology Calculations factory default Sub-Menu consists of 3 pages. The calculations available are the same as the general menu for Radiology/Abdomen and Small Parts. They are:

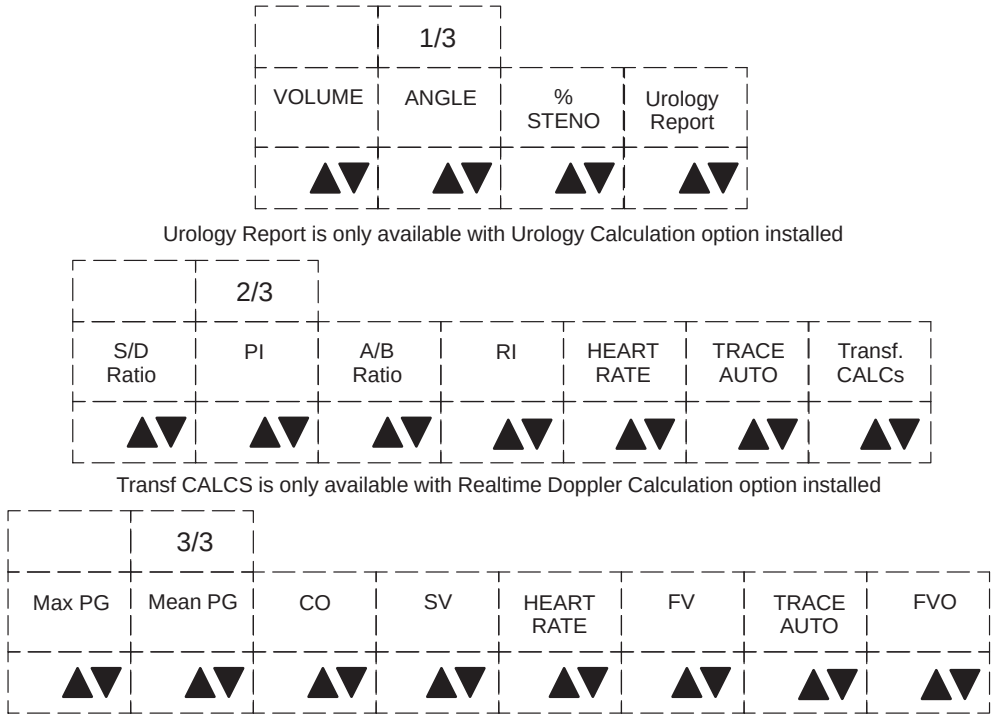


Figure 12–1. Urology Calculation Menus

Refer to the chapters *Abdomen and Small Parts (8)* and *Cardiology (10)* for steps to perform these measurements and calculations.

NOTE: If the Doppler option is not installed with the LOGIQ™ 400 Black/White systems, the Doppler Mode measurements cannot be performed.

Presumed Circle Area Ratio (PCAR)

Presumed Circle Area Ratio (PCAR) Measurement is available with the Urology Calculation Option.

This measurement must first be selected in the Measurement VFD Softmenu Setup Submenu, which is accessed by selecting the “Measurement Menu B” preset on Preset Program page 7. It will then be accessible from the B-Mode Measurement Sub-Menu.

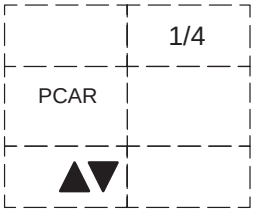


Figure 12–2. Urology Calculation Sub-Menu

Select **PCAR** from the Calcualtion Sub-Menu. The trace curosr appears in B-Mode.

Move the cursor to the measurement start point and press **Set**. Trace the measurement area and press **Set** to fix the PCAR value displayed on the bottom of the screen and calculate the area.

Stepper Volume (STVOL)

The ERB7 probe is designed to be used with the mechanical stepping device option and needle placement guide. The needle placement guide matches the electronic needle placement grid display on the monitor as the biopsy guidezone is displayed.

This measurement must first be selected in the Measurement VFD Softmenu Setup Submenu, which is accessed by selecting the “Measurement Menu B” preset on Preset Program page 7. It will then be accessible from the B-Mode Measurement Sub-Menu.

Refer to the Advanced Options chapter of the *Advanced Reference Manual* for further details.

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Urology Calculation
(software option)

Urology Summary Report

Urology Report Page

The Urology Report Page is is provided to improve productivity and facilitate consistency in Urology procedures. It is available by selecting Urology Report from the measurement Sub-Menu.

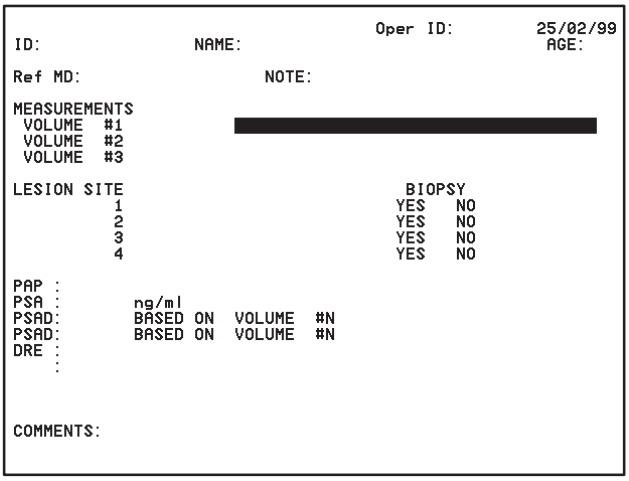


Figure 12–3. Urology Report Page

Urology Report Page (cont'd)

The first, or top portion, is general patient data that was entered on the patient entry menu at the beginning of the exam. This area cannot be edited.

The second is the measurements area. There are 3 fields for volume measurements. The first, second and third volume measurements taken are recorded as Volume #1, Volume #2 and Volume #3, respectively. If the volume measurements were performed by STVOL, *"STVOL"* is displayed.

The system stores the 3 most recent volume measurements. If a fourth measurement is made, Volume #1 is erased. Volume #2 becomes #1. Volume #3 becomes #2 and the fourth measurement is Volume #3. The very first measurement is lost.

Comments, pertinent for that specific volume measurement, may be added to the right of the volume measurement.

The third area is for Lesion Sites. A description can be input (maximum 20 characters each) for each lesion site. To indicate whether the lesion site was biopsied, select "Y" for yes or "N" for no.

The fourth area is for calculations. The PAP (Prostatic Acid Phosphatese concentration) and PSA (Prostatic Specific Antigen concentration) need to be input.

The PSAD is automatically calculated once the single digit field following the words "BASED ON VOLUME" is entered (1, 2, or 3). This represents which volume measurement (corresponding to the entire gland) should be used to compute PSAD. The calculation is dependent on the default selected in the *"PSA Calculation"* preset found on Set Up/System Parameters page 3.

The DRE (Digital Rectal Exam) result are input below the PPSA calculations. Any other exam which is desired to be reported can be input under DRE.

The fifth area is for comments and findings.

PSA Measurement

The *"PSA Calculation"* preset, located on System Parameters page 3, allows PSA to be calculated two ways. The two selections are:

PSAD: Prostatic Specific Antigen (PSA) Density – defined as:

$$PSAD = PSA/Volume$$

PPSA: Predicted Prostate Specific Antigen – defined as:

$$PPSA = Volume \times PPSA\ Coefficient$$

PPSA Coefficient is entered in the *"PPSA Coefficient (1)"* and *"PPSA Coefficient (2)"* presets, located on Preset Program page 4.

PSAD and PPSA are calculated on the Urology Report Page.

Stepper Volume Calculation

Overview

Using the ERB7 probe with the stepping device option, a new volume measurement, named STVOL, is available with the Urology Calculation Option.

A stepper volume calculation (STVOL) is now available with the LOGIQ™ 400 when using the ERB7 probe with the stepping device option.

ERB7 Probe Preparation

The optional 7.0 MHz Transaxial (ERB7) Probe is a micro-convex and linear bi-plane probe for transaxial prostate scanning.

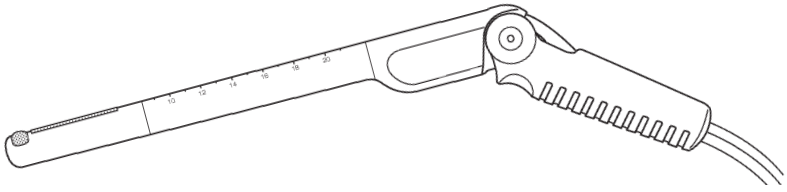
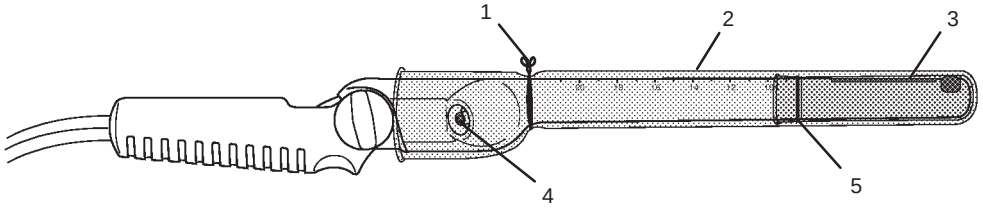


Figure 12–4. ERB7 Probe and cable

ERB7 Probe Preparation (cont'd)

1. Remove the probe from the box and carefully examine it for any damage.
2. Clean and then disinfect/sterilize the ERB7 Probe.
3. Inspect a sterile/sanitary sheath. Place a small amount of ultrasound gel inside the sheath tip (the gel is between the sheath inner surface and the probe aperture).
4. Place the sheath tip over the probe aperture and then pull the sheath end toward the probe handle.
5. Place a rubberband/twist lock over the sheath at the end of the probe shaft. Ensure the rubberband/twist lock is tight around the sheath. Rub your finger over the tip of the probe to ensure all air bubbles have been eliminated.
6. Place a small amount of ultrasound gel on the gel-filled sheath tip outer surface.

NOTE: Remember to rinse all probe sheaths of powder before placing on the probe. Powder can degrade the scan image displayed.



1 Twist Lock
2 Sterile/Sanitary Outer Sheath
3 Optional Finger Cot for Water Path
4 Optional Water Path Inlet
5 Optional Finger Cot Rubberband for Water Path

Figure 12–5. Sterile/Sanitary Sheath Placement

Performing STVOL Measurement

Stepper Volume (STVOL) is the method used to calculate the volume of an organ using the LOGIQ™ 400 Urology software, Transaxial Probe and a mechanical stepping device that moves the probe in fixed increments.

CAUTION

The stepper volume measurement works only in B-Mode with Convex Scan (NOT available Linear scan).

Stepper Volume Formula

Stepper Volume (STVOL) is the method used to calculate the volume of an organ using the LOGIQ™ 400 Urology software, Transaxial Probe and a mechanical stepping device that moves the probe in fixed increments.

The calculation is based on the fact that each step or area measurement is taken at equal stepper increments. The area measured at each slice is then used to compute the total volume of the organ, according to the following model:

For **N** slices, there are N–1 volumes between the slices plus a small volume at each end.

It is assumed that the small volumes of the end caps are cones with a base equal to the measured area of the end slice and height equal to the slice spacing. The cones will have volumes $\mathbf{V=A_1\ d/3}$ and $\mathbf{A_N\ d/3}$ for slices **1** and **N** respectively, where **d** is the spacing between the slices.

The volumes between the slices are assumed to be segments of a paraboloid of revolution, where the volume between any slice n and n+1 is $\mathbf{(A_{n+}A_{n+1})d/2.}$

The sum of the volumes between slices is:

$$\mathbf{V=d\ [\ (A_{1+}A_2/2)+(A_{2+}A_3/2)+....+(A_{n-1+}A_n/2)]}$$

Therefore, the total volume of the organ is calculated as:

$$\mathbf{V=d\ [\ (5/6)A_{1+}A_2+A_{3+....+}(5/6)A_N]}$$

Press **Freeze** to have an Image of the organ to be measured. The probe should be inserted to its most cephalic position (i.e base of the prostate).

Press **Measurement** to fix the STVOL measurement.

Mechanical Stepper/Needle Placement Guide Option

This mechanical stepping device is intended to be used with the LOGIQ™ 400 and the 7MHz Transaxial (ERB7) Probe.

The variable position mechanical stepping device is used to hold the 7MHz Transaxial (ERB7) Probe, lock the probe in place and move the probe in small increments throughout an organ in cross-sectional slice. Used with the LOGIQ™ 400 Stepper Volume Calculation, a complete three–dimensional volume calculation can be made of an organ.

The needle placement guide template matches the LOGIQ™ 400 electronic needle placement grid for the 7MHz Transaxial (ERB7) Probe to aid in needle placement.

The universal table mounting system holds the stepper and is compatible with most radiology and urologic tables.

CAUTION

Standard stepper increment is 5.0mm. Assembly for 2.5mm increment movement is available. Therefore it is necessary to match the stepper movement to the ultrasound system software.

Refer to the Stepping Device Instructions for details.

Recording Images

Image Memory

Storage

Without the optional Cine Memory extension, the following number of images or proper combination of formats can be saved in memory:

- Single Format 8 images
- Dual Format 4 images
- Timeline Format 4 (NTSC) or 3 (PAL)

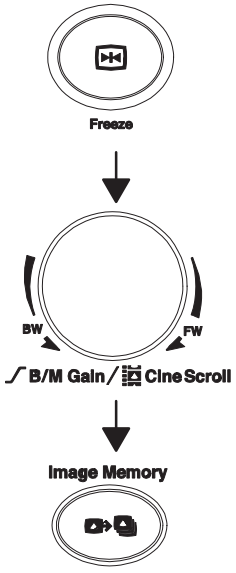
With the optional Cine Memory extension, the following number of images or proper combinations of formats can be saved in memory:

- Single Format 8 images
- Dual Format 8 images
- Timeline Format 4 (NTSC) or 3 (PAL)

The LOGIQ™ 400 has storage space for images in system memory.

This storage is temporary. The images are erased when the **New Patient** key is pressed or power is turned off.

Storage (cont'd)



To save images in system memory:

Press **Freeze** to stop image acquisition.

Use the **Cine Scroll** control, if necessary, to display the best image.

Press the **Image Memory** key. The displayed image is saved to system memory and the number of images currently stored is displayed at the bottom of the screen.

The system gives a Memory Full warning beep each time an image is about to be stored in a full memory.

Pressing **Image Memory** after the warning deletes the oldest image in system memory and saves the current displayed image.

Recall

To recall images stored in system memory for review or archival:

- Press the **Image Recall** key. The soft-menu displays the Image Recall Sub-Menu with the display mode and time the images were stored.
- The last image to be placed into Image Memory is displayed.

Use the appropriate Sub-Menu up/down arrow keys to select the desired image to recall.

After the recalled image is displayed, no image post processing can be performed. Only Comment, Measurement, Body Pattern, Clear, Ext Video and Mic functions are available.

Press **Freeze** to continue scanning or press **Image Recall** to return to the previous system status before Image Recall was initially pressed.

Helpful hints

Hints

- Images stored in system memory will be lost if the **New Patient** key is pressed or power is turned off.
- Images are stored in system memory on a “first in, first out” basis (maximum 8 images).
- Use the highest quality videotape possible and record in the slowest speed possible.

Peripheral Devices

The LOGIQ™ 400 can save scan images to a variety of optional devices. Available archiving options are:

- Black/white video page printer
- Color video page printer
- Video cassette recorder (VCR or VTR)
- Line Printer – USA Only
- Laser camera

Device	Manufacturer	Model	Video Signal
Black & White Video Page Printer	SONY	UP-890MD	NTSC
	SONY	UP-890CE	PAL
	SONY	UP-890MDG	NTSC/PAL
Color Video Page Printer	SONY	UP-1800	NTSC
	SONY	UP-2800	PAL
	SONY	UP-2850	PAL
	SONY	UP-2900	NTSC
	SONY	UP-2950	NTSC
VCR	SONY	SVO-9500MD	NTSC
	SONY	SVO-9500MDP	PAL

Table 8–2. Approved Optional Recording Devices

CAUTION

DO NOT connect any probes or accessories without approval by GE.

All peripherals are considered options to the console. Those listed in this section have been tested and verified to be compatible with the LOGIQ™ 400 system. Please refer to the local Sales or Field Service representative for the latest list of approved peripherals.

WARNING

When using any peripheral device or accessory, observe all danger messages, warnings, and cautions given in peripheral operator manuals.

Black/White Video Page Printer

Operations

Remote control of the B/W printer is limited to the print function only. Adjustments to print quality are done on the page printer. No status or error messages are available to be displayed on the LOGIQ™ 400.

There is a six second delay built in to the **Record** key recognition. This eliminates improper operation if the **Record** key is pressed more than once in rapid succession.

To print an image:

Press **Freeze** to stop image acquisition.

*NOTE: Remember that **Cine Scroll** may be used to look at previous image frames to obtain the best image.*

Press **Record 1** to activate the print function on the standard B/W Video Page Printer.

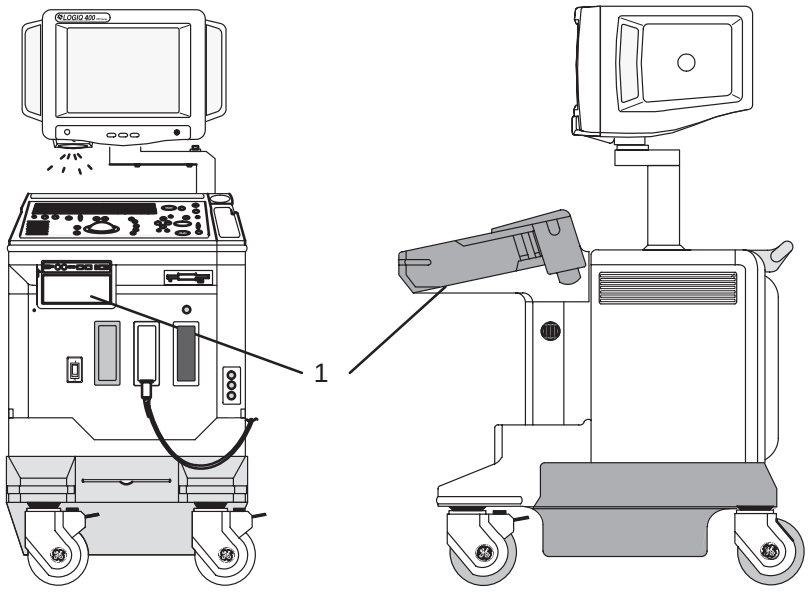
*NOTE: The **Record 1** and **Record 2** keys can be preset to activate almost any peripheral device. This is done by assigning the key control to the output port to which the peripheral is attached in the Set Up/System Parameters menu page 5.*

For details on the page printer operation, consult the Sony Operator Manual provided with the printer.

Black/White Video Page Printer (cont'd)

Configurations

The Sony UP-890 Black and White Video Page Printer is mounted on the left side of the LOGIQ™ 400 under the keyboard. The Sony connections are Video, AC power, and Remote Shutter (Expose).



1 Black/White Page Printer

Figure 13–1. B/W Page Printer Location

Black/White Video Page Printer (cont'd)

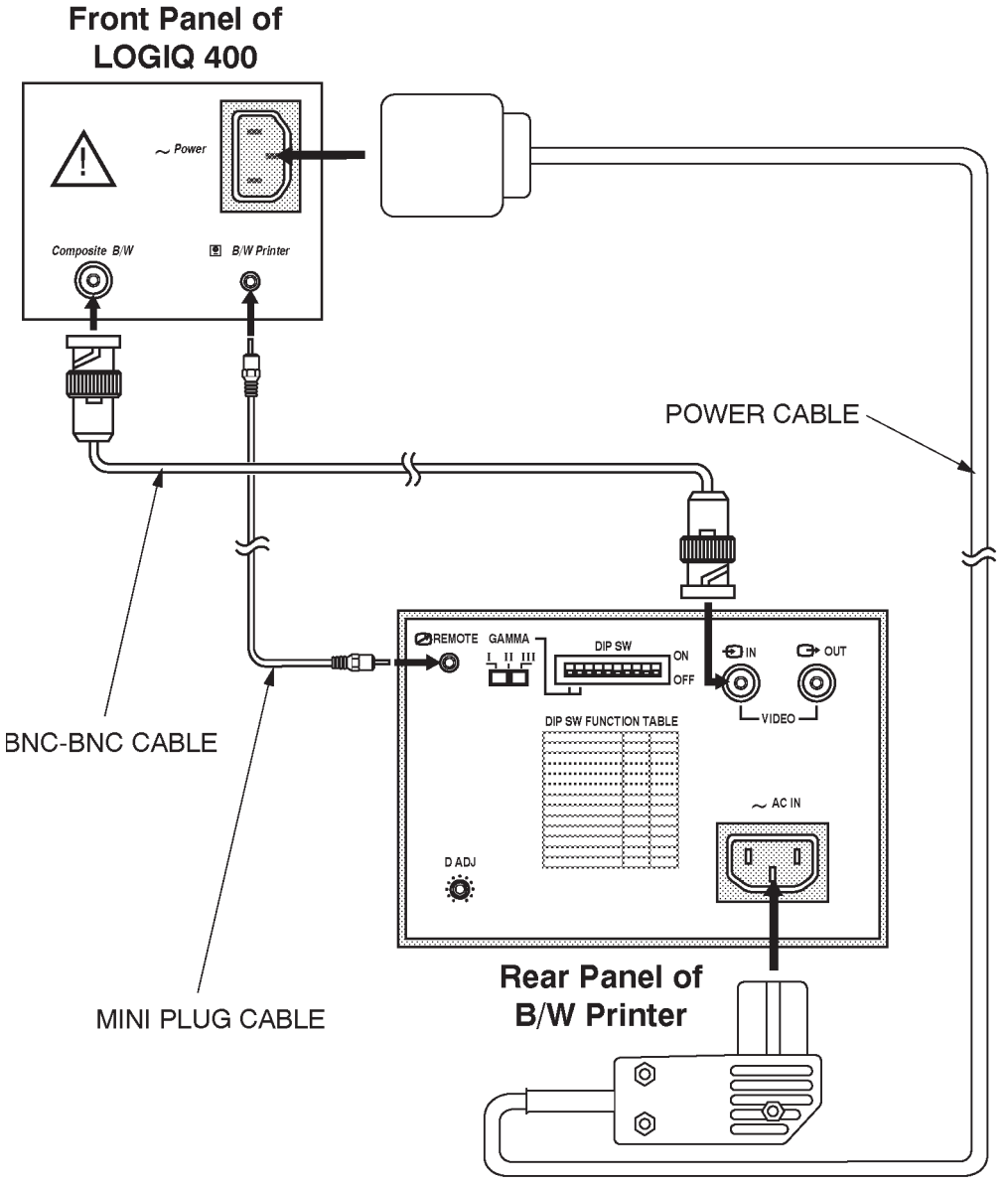


Figure 13–2. B/W Printer Connections

Color Video Page Printer

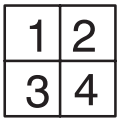
Operations

The color video page printer allows for recording 1 or 4 images on a single sheet of paper in color or Black/White.

When the LOGIQ™ 400 is powered on, the Preset/Set Up selections set the memory mode (1 or 4 images) and the input signal select (RGB, Video, S-Video) on the color printer. All other functions need to be selected at the printer control panels.

The **Record 1** or **Record 2** keys can be programmed in the Preset/Set Up function to activate the print function on the Sony color page printer.

One image format: After the **Record** key is pressed, the image is first stored in printer memory and then printed.



Four Image Format: The first, second and third time the **Record** key is pressed, the image is stored in printer memory. The fourth time the **Record** key is pressed, the image is stored in printer memory and all four are printed on one sheet.

The color video page printer provides some feedback if there is an error in the print process. The following error messages could be displayed due to color printer problems:

- Paper is jamming. Check paper.
- Check ribbon cassette setting.
- Check paper cassette setting.
- No paper. Set paper.
- Place paper print side up.

For details on the page printer operation, consult the Sony Operator Manual provided with the printer.

Color Video Page Printer (cont'd)

Configurations

The Sony UP-1800 Color Video Page Printer connections are Red, Green, Blue, Sync, and RS-232 Remote Control.

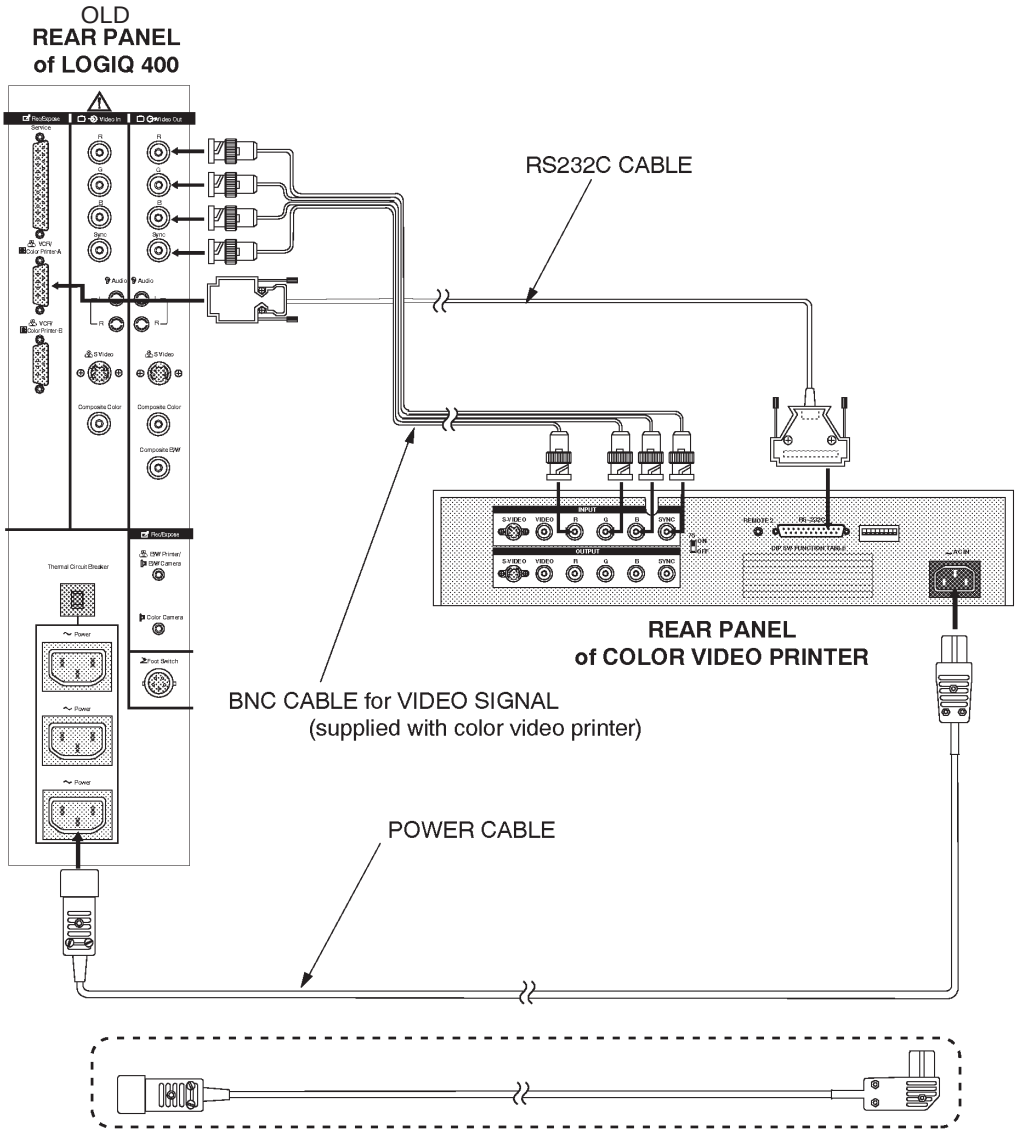


Figure 13–3. Color Page Printer Connections with Old LOGIQ™ 400 Rear Panel

Color Video Page Printer (cont'd)

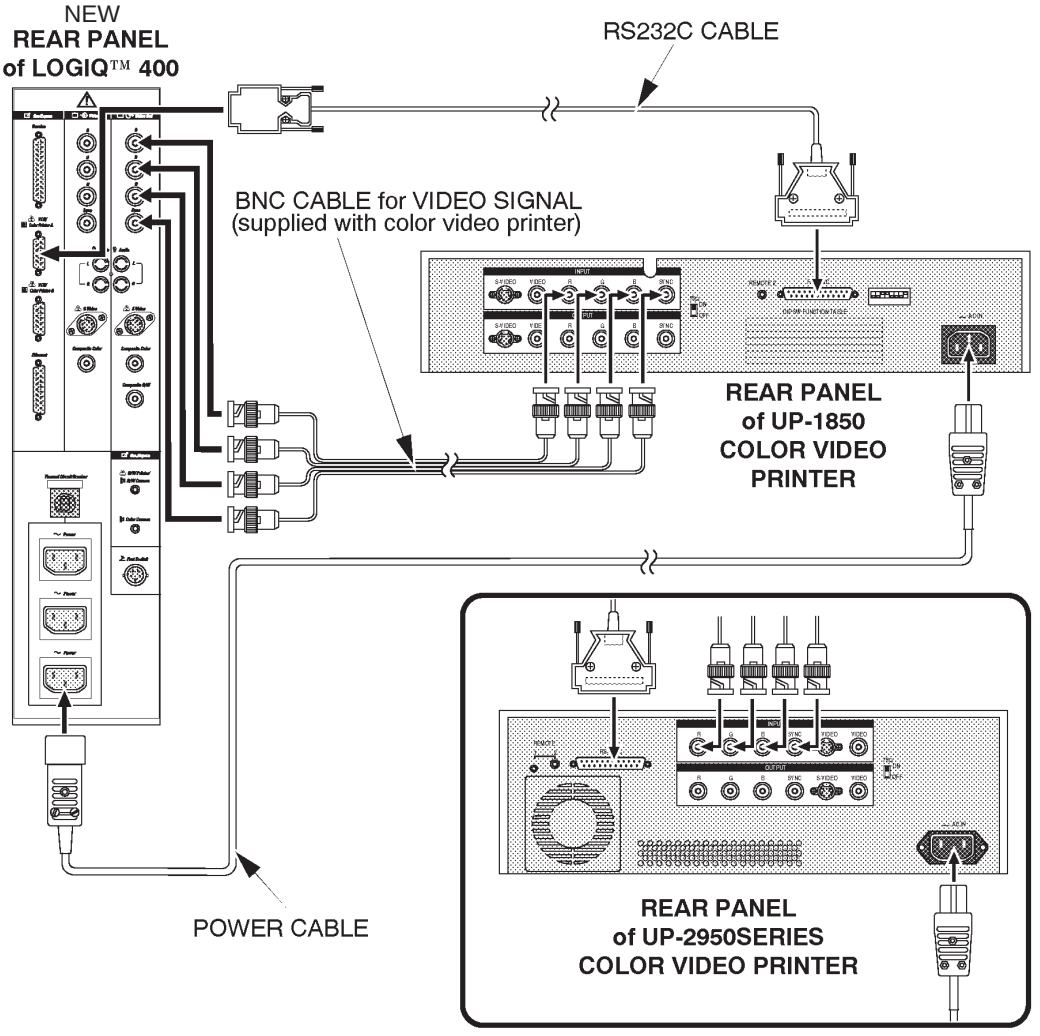


Figure 13–4. Color Page Printer Connections with New LOGIQ™ 400 Rear Panel

Video Cassette Recorder (VCR)

Operations

An optional video cassette recorder (VCR or VTR) is available for the LOGIQ™ 400. The optional VCR is S-VHS compatible for improved recording quality.

The LOGIQ™ 400 supports remote control of the Sony SVO-9500MD/MDP S-VHS Video Cassette Recorder only. Other VCRs can record and playback video with the LOGIQ™ 400, however remote control, advanced search functions and auto calibration will not be supported. Control of approved VCRs other than the Sony SVO-9500MD/MDP must be done by the VCR front panel.

NOTE: Measurements from VCR Playback video requires the optional VCR measurement playback board for proper operation.

Explanation of VCR operations assumes that the Sony SVO-9500 is being used. It also assumes that the “Heading VCR Playback” option is installed.

CAUTION

The system can keep track of patient and tape information. The system can search a tape for patient images. However, the system CANNOT:

- Stop or indicate when it comes to the end of the last study on the tape.
- Prevent recording over previous studies if record is pressed while positioned in the middle of a study.

Without the Heading VCR Playback option:

- The hard drive does not store patient or tape id information.
- Auto calibration for playback measurements is not available.
- Image, Patient and Tape Search functions are not available.

The Record keys and foot switch can be programmed in the Preset/Set Up menu to activate the Record/Pause function for the VCR.

Video Cassette Recorder (VCR) (cont'd)

Configurations The Sony SVO-9500MD connections are S-VHS Video In/Out, Audio In/Out, and RS-232 Remote Control.

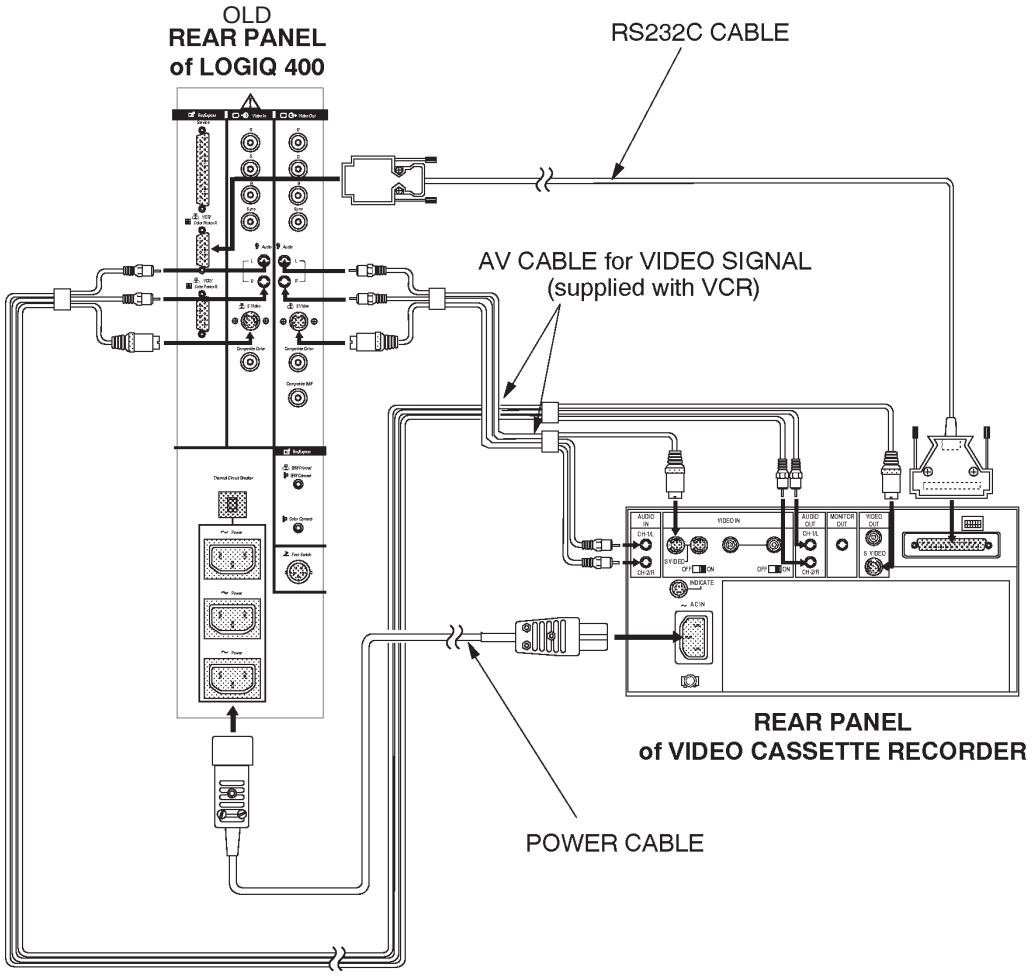


Figure 13–5. VCR Connections with Old LOGIQ™ 400 Rear Panel

Video Cassette Recorder (VCR) (cont'd)

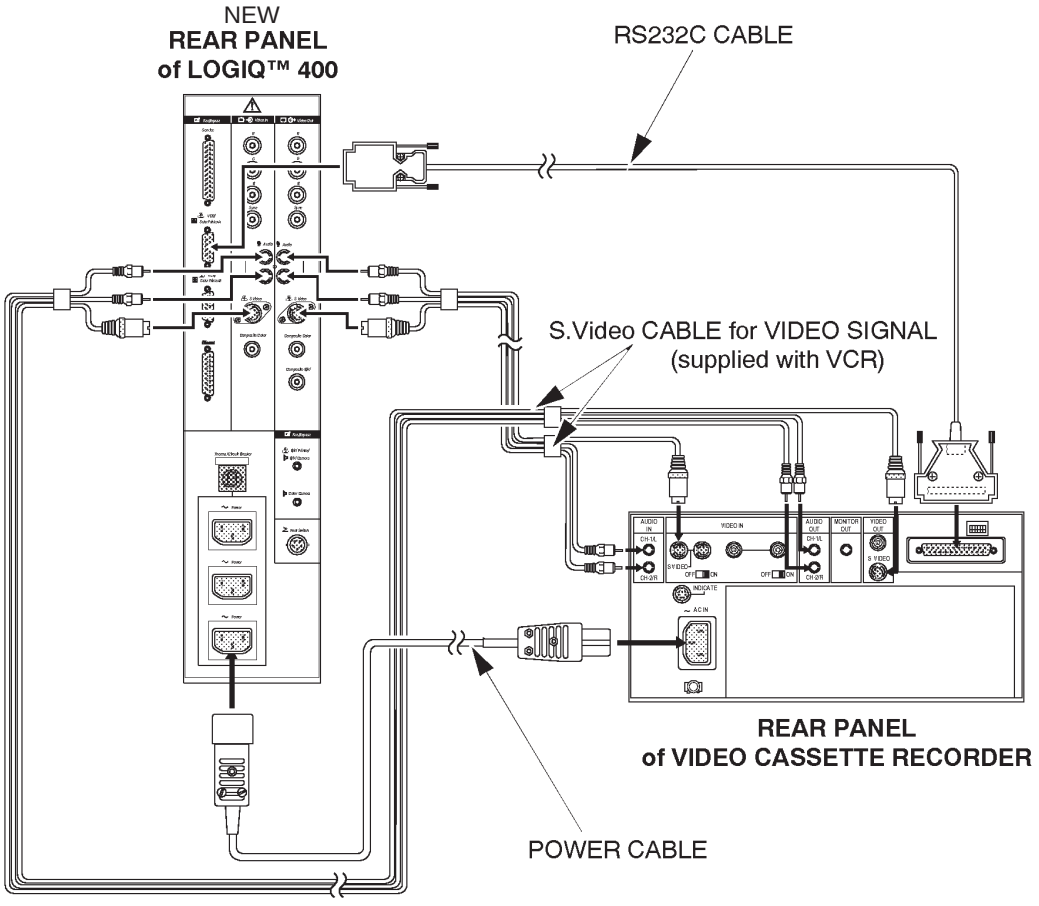


Figure 13–6. VCR Connections with New LOGIQ™ 400 Rear Panel

Line Printer (USA ONLY)

Operations

Display the desired report page:

- OB
- GYN
- OB Graph
- Cardiology
- Vascular
- Anatomical Survey

While the report page is displayed, press **Ctrl** + **R** to start the printing process. This Ctrl + R function is not available unless the report page is displayed on the screen.

The message “Preparing for print now” is displayed. After two seconds the message changes to “Newpt/Power Off will delete print data”. This message is displayed until the print operation is complete.

Hints

If more than one report page is to be printed, the desired report page must be displayed and Ctrl + R pressed.

If printing was not completed due to some sort of error, the failed report must be displayed and Ctrl + R pressed again.

Ensure all reports have printed prior to deleting report data by pressing **New Patient** or power off.

Configurations

The line printer will be connected to a serial port on the system. This can be accomplished at Port MIC, Port A or Port B on the rear panel.

The appropriate parameter in Set Up/System Parameters page 5 must be set to “Line Printer”.

Laser Camera

The LOGIQ™ 400 can print images to a Laser Camera for archival.

Contact the local GE Service Representative for details about hook-up and operation.

Video Signal Specifications

Table 8–3 gives the video specifications of the Ultrasound system. This data may be needed when interfacing the system with OEM cameras or recording devices.

	NTSC	PAL
Total Lines per Frame [line]	525	625
Vertical Frame Frequency [Hz]	60	50
Horizontal Scanning Frequency [kHz]	31.469	31.250
Displayed Image Pixels [mm]	239.5 by 180	239.5 by 180
Total Horizontal Line Time [µs]	31.78	32.00
Horizontal Display [µs]	24.77	24.41
Front Porch Width [µs]	1.39	1.54
Sync Pulse Width [µs]	2.36	2.34
Back Porch Width [µs]	3.26	3.71
Total Horizontal Blanking [µs]	7.01	7.59
Vertical Blanking Interval [H]	31.50	38.50
Vertical Front Porch Width [H]	6.5	9.0
Vertical Sync Width [H]	3	2.5
Vertical Back Porch Width [H]	22	27
Pixel Clock [MHz]	24.5454	29.5000
H [µs]	31.78	32

Table 8–3. Video Signal Specifications

Maintenance

Consult the peripheral device operator manual for necessary routine maintenance.

Image Archive (option)

Overview

Image Archive is an option to store and recall scan images using a 3.5 inch Magneto Optical Disk (128 or 230 Megabytes) and/or a hard disk (HD). The Magneto Optical Disk (MOD) allows for much faster and greater storage capacity than a Floppy Disk Drive (FDD).

Along with the increased speed and storage capacity, the user can perform measurements and calculations on images recalled from a MOD/HD. Images recorded as hard copy (film) do not allow for additional measurements at a later date. Images recalled from a MOD/HD have much better resolution than VCR playback images, providing better detail for additional measurements.

In addition to the image archive function, the MOD allows for a System Backup disk to be made in the unlikely event of a hard disk failure. System software updates and service diagnostics may also be accomplished much faster.

Archive Functions

The Image Archive option allows the user to perform the following functions:

- Archive Image to MOD/HD
- Recall Image from MOD/HD
- Patient File search of MOD, HD or DICOM queue
- MOD Media file search
- Delete a file from MOD/HD
- Copy images to/from HD from/to MO
- Format the MOD disk
- Eject the MOD disk from the drive

Related Preset Parameters

Two selections must be made in the Set Up/Preset Program Sub-Menu page 2 that affect image archiving.

Image Archive Compression:

- **No** is no DEFF format image compression.
- **Yes** is for DEFF format image compression. Storage time for a compressed image is more than double.

NOTE: If image compression is used, images saved by the LOGIQ™ 400 cannot be read on other TIFF readers, DEFF devices or the LOGIQ ™ 700. However, they can be read on the LOGIQ ™ 500.

B/W Image Archive & Color Image Archive:

- **B/W** is for storing in black and white format (less storage space required).
- **Color** is for storing in color format (more storage space required).

NOTE: An External Video Image is recognized as a color image and will use the Color Image Archive preset.

System ID Entry/Display

The LOGIQ™ 400 system ID number is assigned at the factory. A System ID should be unique for a system. This number is used by the system when initializing a MOD (image archive option) for image storage.

If there is more than one system at a facility, the ID numbers will be different. A scanner will write to a MOD if the media was initialized on a different scanner (different ID number). However, images can only be deleted on the system that initialized the MOD.

NOTE: If there is more than one LOGIQ ™ 500 or LOGIQ™ 400 in a facility or group of hospitals, each system should have it's own unique System ID number, unless it is necessary to delete MOD images on any system.

Media Format (DEFF)

Display the Archive sub-menu.

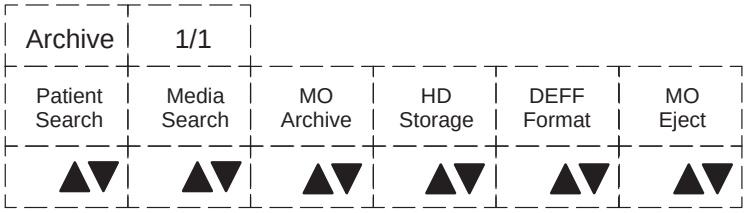


Figure 13–7. Archive Sub-Menu

Select **DEFF Format**. The following messages are displayed during the disk initialization and formatting process:

“Do you continue ? (Y/N)”

Insert the disk and press ‘Y’ to continue or ‘N’ to quit. If ‘Y’ is pressed,

“Initializing now”

appears. The disk format function is in progress.

The MO (disk) ID and System ID will be written on the disk media. One system can register a maximum of 10,000 disks.

If the number of registered disks is greater than 10,000, previously registered disk information will be overwritten in order to register the new disk information.

To avoid confusion, it is essential that care is taken not to attempt image storage to a previous (old) disk who’s MO ID and System ID is not available (IDs have been deleted from the media file).

NOTE: The media list on the Media Search Menu contains both previous (old) and current (new) disk information.

Disk Verification

In order to protect images from being deleted by other LOGIQ™ 400 systems, the disk is always verified by the system before it can be used.

If the MO disk is not inserted into the drive or an unformatted MO disk is inserted, the following message is displayed:

"MEDIA IS EITHER UNMOUNTED OR UNFORMATTED."

When a disk is inserted into a drive, the system first reads the MO (disk ID) and System ID from the media. These two IDs are displayed at the bottom of the monitor while the system verifies that they are registered in the verification list on the system hard drive.

Archiving Images

Image Comments

With the comment cursor in the home position, four characters can be entered as a comment that is stored with the patient name, id and date of the scan. Refer to Figure 13–8 on *13–23* for examples.

MO Archive

An image can be archived to a MO drive. To archive the image, display the Archive sub-menu. Press the MO Archive up/down arrow keys.

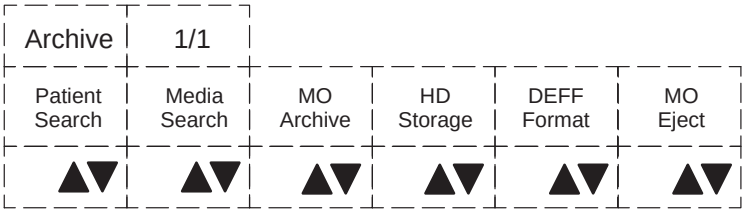


Figure 3–27. Archive Sub-Menu Page 1

The following message is displayed during the archive process:

“In Progress. Please wait. MO Free : xxxMB”
where xxx is the space available on MOD for future archival.

System operation is interrupted for five seconds before scan operation can continue. The image archival operation is then performed in the “background”.

NOTE: An alternative method to archive images to the MO drive is by using the Record 1and/or Record 2 keys. The Record 1 B&W, Record 1 Color, Record 2 B&W and Record 2 Color presets, located on Set Up/System Parameters page 5, allow these keys to be programmed to automatically archive the image when pressed.

To save the Patient Entry Menu or a Report Page to MOD, this alternative method must be used.

Archiving Images (cont'd)

Hard Disk Storage

An image can be stored to a Hard Disk Drive. The capacity of the HDD storage is up to 600 images.

To store the image to the Hard Disk Drive, display the Archive sub-menu. Press the HD Storage up/down arrow keys.

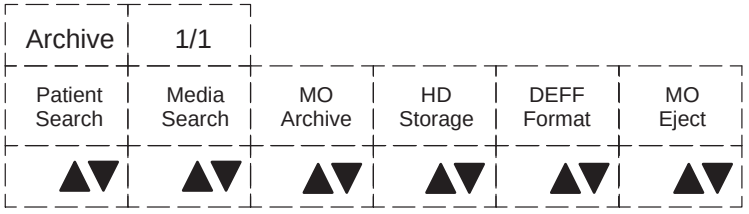


Figure 3–28. Archive Sub-Menu Page 1

The following message is displayed during the storage process:

"In progress. Please wait. HD Free : xxx"
xxx is the number of images available for future archival.

System operation is interrupted for five seconds before scan operation can continue. The image storage operation is then performed in the "background".

NOTE: An alternative method to store images to the hard disk is by using the Record 1and/or Record 2 keys. The Record 1 B&W, Record 1 Color, Record 2 B&W and Record 2 Color presets, located on Set Up/System Parameters page 5, allow these keys to be programmed to automatically store the image when pressed.

To save the Patient Entry Menu or a Report Page to MOD, this alternative method must be used.

Patient Search

Select **Patient Search** from the Archive Sub-Menu. The Image Archive Patient Search Menu is displayed on the monitor as shown in Figure 13–8.

MO STATUS—Shows the type of disk in the drive as an image disk.
MO FREE—Shows the amount of memory space available on the MOD in MegaBytes.
HD FREE—Shows the number of images available to store on the Hard Drive.
COMMENTS—Prior to storing an image, a four character comment can be entered if the comment cursor is in the home position. The comment is displayed to the right of the date column.

Figure 13–8. Patient Search Menu

From the Image Archive Patient Search Menu, the following functions are available:

- Show the storage place (MO, HD or Queue)
- Show image(s) in the DICOM queue
- Copy image(s) to/from HD from/to MO
- Display the image(s) as Multi-Display format
- Show the type of an image

NOTE: DICOM related keys are not displayed if the DICOM Storage Option is not installed.

Patient Search (cont'd)

Image Types

The table below summarizes the functions on the Image Archive Patient Search Menu as applied to different image types.

Image Type	Image Search (list up)	Image Tag/ Untag	Image Recall	Image Lock/ Unlock	Image Delete	Image Copy	DICOM Send
on MO	√	√	√	√	√	√	√
on HD	√	√	√	√	√	√	√
in Queue	√	√	√	NA	NA	√	√
LZW compressed	√	√	√	√	√	√	NA

NA: Not Available

Table 15–1. Search Menu Functions on Different Image Types

Search Criteria

A specific MOD can be searched for patient files that meet certain criteria. The hard disk data base and backup MODs can also be searched for a list of MODs and files that meet the criteria listed below.

Patient Name	Maximum 29 characters
Patient ID	Maximum 14 characters
Date	Format specified in System Parameters page 1.

A search list can be displayed from a combination of files on the hard disk, MO disk or DICOM queue. To select the search type, move the cursor over MO, HD and/or QUE in the "From MO HD QUE" portion of the Image Archive Patient Search Menu. Press the **Set** key. An asterisk mark (*) indicates the selection. For example, when only MO is selected, the screen display changes from "From MO HD QUE" to "From *MO HD QUE". The search list will show MO archived images.

Search Criteria

File discriminators

There are discriminators displayed in front of the file name that indicate whether they are archived. The following file discriminators are:

SYMBOL	DESCRIPTION
None	Indicates a file on Hard Disk.
+	Indicates a file on MO Disk.
/	Indicates a file on Hard Disk as DICOM queue.

Criteria Input Region

Both the Patient Search Menu and Media Search Menu have a criteria input region as shown in Figure 13–9.

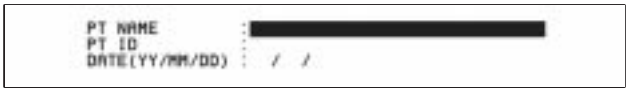


Figure 13–9. Criteria Input Region

Type the desired name in the highlighted region. Press **Return** or **Trackball** to the PT ID region.

Input the Patient ID. Press **Return** or **Trackball** to the Date region.

Input the desired date. Press **Return** or **Trackball** to move the cursor out of the criteria input region. The search function starts immediately.

Hints

Spaces can be used as a wild card in the date entry. For example:

MM/ /	lists everything for a specific month.
/ /YY	lists all in a specific year.
MM/ /YY	lists all within a specific month of a specific year.

If nothing is entered in one or more of the search criteria, a list of files is displayed that match the remaining criteria entered.

Patient Search (cont'd)

Searching the MOD

The search function is initiated when the **Trackball** is used to move the highlighted cursor out of the criteria area or the **Return** key is pressed while in the Date entry area.

The first 15 files are displayed on the monitor. If the search is not complete, the message:

"In Progress, Please wait"

appears at the bottom of the monitor. This message remains until the search process is totally complete.

NOTE: Images which are not stored on the GE LOGIQ™ series systems will not be listed by the patient search function or displayed on a LOGIQ™ series machine.

Hints

In order to perform any other function, the user must wait until the search is complete or press **Ctrl**, **C** simultaneously to cancel the search function.

If no search criteria was entered by the user, a complete file listing of the entire MOD is executed. Only 15 files are displayed at one time on the monitor.

Use the Ellipse up/down arrow keys to scroll to the next or previous patient list page.

Copy an image

To copy an image from the HD (MO) to MO (HD):

1. Select the image to copy by pressing the **Set** key. Multiple images can be selected.
2. Move the cursor to the Image Copy column.
3. Press the **Set** key. The image is copied to the MO (HD) from HD (MO).
4. Move the cursor to List All and press the **Set** key to reflect the copied image in the Image Archive Patient Search Menu.

The following message is displayed if the capacity of the HD or MO is not enough for an image to be copied.

Too much data. Copy Failed.

Patient Search (cont'd)

Display the image as Multi-Display format

Multi-Display format provides a way to view all images on the Patient Search Menu at one time. From the Image Archive Patient Search Menu, the store image can be displayed in multiple images as 2x2, 3x3 or 4x4.

To display the image as Multi-Display format:

1. Move the cursor to the right of Multi-Disp column.
2. Select the format (2x2, 3x3, or 4x4) by pressing the **Ellipse** up/down arrow keys.
3. Move the cursor to the Multi–Disp column.
4. Press the **Set** key.

To select and display the image in the Multi-Display format:

1. Move the cursor to the desired image. The image information (Patient Name, Patient ID, file name, etc) is displayed at the bottom of the monitor.
2. Press the **Set** key to select the image. If needed, multiple images can be selected.
3. Press the **Ellipse** up/down arrow keys to display the selected images.
4. If multiple images are selected, the next image will be displayed by pressing the **Ellipse** up/down arrow keys.
5. Press the **Freeze** key to return to the Multi-Display format screen.
6. Press the **Freeze** key again to return to the Image Archive Patient Search Menu.

Type of an image

A symbol appears in front of the date to indicate whether the image is color or gray scale. The symbols are as follows:

SYMBOL	DESCRIPTION
G	Gray scale image.
C	Color image.
g	LZW compressed gray scale image.
c	LZW compressed color image.

Patient Search (cont'd)

Menu Commands

The commands listed at the bottom of the Patient Search Menu can be used to manipulate the file information displayed.

Search	Changes the current mode to the search criteria input mode.
Tag All	Selects all images on the displayed page.
Recall	Recalls an image from the MOD for display on the monitor.
Lock	Locks an image file. A locked file has an asterisk (*) after it's file number and cannot be deleted while locked.
Unlock	Unlocks an image file.
Multi-Disp	Displays the images as multi-display format.
List All	Displays all images on the MOD in the Patient Search Menu.
Image Copy	Copies an image to/from HD from/to MO.
Exit	Exits the Patient Search Menu.
Delete	Erases an unlocked image file from the list. A file must be unlocked before being erased. *The image is not deleted from the affected MO*.

NOTE: An image file will still be listed in the Media Search Menu even though the file has been deleted from the Patient Search Menu.

Ellipse	Scrolls between the available pages to be displayed.
CTRL+C	Cancels the search process.

Image Selection for Recall

To select an image for recall from the Patient Search Menu:

- **Trackball** to highlight the desired image file and press **Set**. The image file data will be outlined with the box.
- **Trackball** to highlight the next image file and press **Set**.
- Repeat the procedure to “TAG” all of the desired image files to be recalled.

*NOTE: If all the files are required for recall, Trackball to TAG ALL and press **Set**.*

Once all the desired image files are tagged, **Trackball** to RECALL and press **Set**.

The first image is displayed. The **Ellipse** up/down arrow keys are used to display the next or previous image.

Image Recall Process

During the Image Recall process, from the Patient Search Menu, the message:

“In progress. Please wait.”

is displayed; changing modes and inputting scan parameters are not allowed.

To quit the recall process, press the **Freeze** key. The system returns to the previous menu displayed.

Hints

Storage of a recalled image can be accomplished as previously described. A new image is stored on the MOD and the original recalled image remains on the MOD unchanged.

Media Search

The Image Archive option has the ability to store a file of all registered (Own–System) disks on the hard drive. This file consists of MO (disk) ID, Patient ID, Patient Name and Date with note information.

Hard Disk Capacity

The capacity of the hard drive to store all media information is limited.

When the hard disk has reached its capacity to store media information, the user is asked to make a Backup MOD. The following message is displayed:

“Too much data. Store failed.”

The user should perform the Backup function at this time.

The Media Search function can search this data base or back-up MODs and indicate which Disk ID number contains information that meets the search criteria.

The media search menu is shown in Figure 13–10.

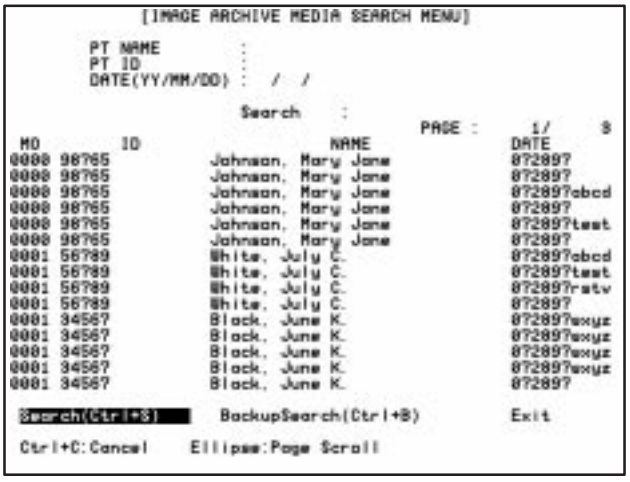


Figure 13–10. Media Search Menu

Menu Commands

The commands listed at the bottom of the Media Search Menu can be used to manipulate the file information displayed.

Ellipse	Displays the next page or previous page of files
CTRL+C	Cancels the search process
Search (CTRL+S)	Changes the current mode to the search criteria input mode
Backup Search (CTRL+B)	Executes search of media backup MODs
CLEAR	Clears (delete) entered characters in highlighted criteria input area
Exit	Exits the Media Search menu

Messages

Messages displayed during the Media Search are similar to those displayed during Store Image, Image Recall and Patient Search. These messages are:

“In progress. Please wait.”
“Search failed.”
“MEDIA IS EITHER UNMOUNTED OR UNFORMATTED.”

The following message is displayed when the last page of the media list is displayed on the monitor:

“There may be file in Backup Media fits this criteria.”

The user should then search any Media backup disks for desired files.

NOTE: When both NTSC and PAL images are stored on the same MO (disk), the following message is displayed: “Incompatible image are not listed up.”

Media File Recall

It is important to note that image files CANNOT be recalled from the media search menu. This function simply gives the user a list of all MO (disk) ID numbers, Patient Names, Patient IDs and Dates that meet the search criteria.

MO Eject

To eject a disk from the drive, the user must select MO Eject from the Archive sub-menu.

“Eject MO from the drive now.”

is displayed on the monitor. The inserted MO is then ejected from the drive automatically.

NOTE: After a MO is inserted into the drive and the search process is executed from the Patient Search Menu or the Media Search Menu, selecting MO EJECT from the soft menu is the only method to eject the MO. The MO cannot be ejected by the eject button on the front of the drive.

Advanced Recording Option

(software option)

DICOM

Digital Imaging and COmmunications in Medicine (DICOM) provides an interface between the LOGIQ™ 400 and imaging/recording devices on a network.

DICOM implementation changes how peripherals are set up. Refer to the *Advanced Reference Manual* for further details.

Time Adjustment

Overview

The system clock for the LOGIQ™ 400 is set by service personnel to the local time during the installation process.

If any other time adjustment is needed during the year, the clock can be changed in the Set Up/Utility Menu.

Time Adjustment

To adjust the system clock:

- Select the **Set Up** Top Menu.
- From the Set Up Sub-Menus, select Utility. The Utility Menu appears as shown in Figure 14–1.

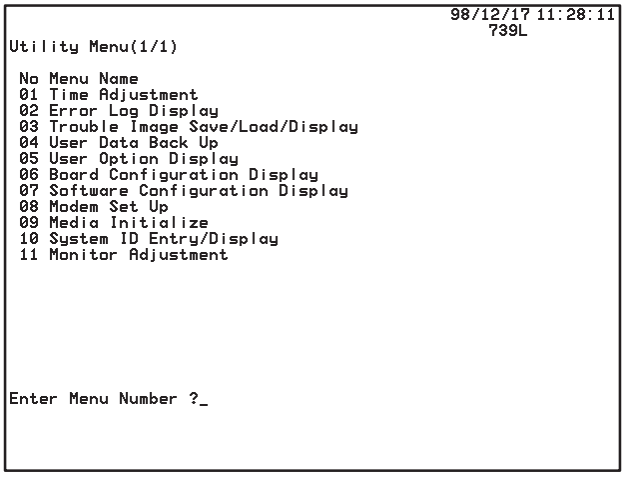


Figure 14–1. Utility Menu

Time Adjustment (cont'd)

- Enter menu number "1" or "01" (Time Adjustment) in the Utility Menu and press **Return**. The Time Adjustment Menu appears as shown in Figure 14–2.

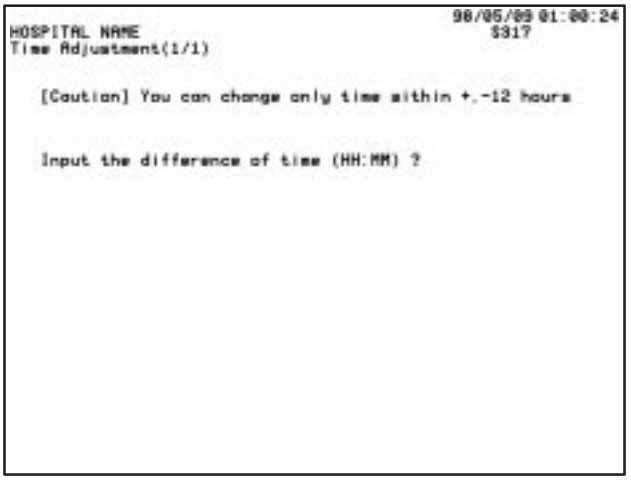


Figure 14–2. Time Adjustment Menu

NOTE: Time is changed by adjusting the current time a maximum of plus or minus 12 hours.

- To Advance (add) the time, type in the number of hours and minutes to add to the currently displayed time. HH:MM is the format to use.
- To Retard (subtract) the time, type a minus sign (–) then the hours and minutes to be subtracted from the currently displayed time. –HH:MM is the format to use.
- Press **Return**. This completes the time adjustment and the Utility Menu reappears with the new time displayed.
- Press the Utility up/down arrow keys to return to the previous scan mode.

The 12 hour display format has no am/pm indicator. The date will change at noon if the set time is 12 hours off.

Preset Parameters

Overview

LOGIQ™ 400 presets provide the user with a powerful tool to customize initial system operation for a particular exam type.

The organization structure of the presets in the system is as follows:

- Within each of the 7 exam categories to choose from in the patient entry menu, there are 8 user programmable and up to 8 factory applications presets.
- Parameters used in these presets are divided into 3 groups: Preset Program, Custom Display, and System Parameters.
- Changes to System Parameters affect all applications presets in all exam categories. These are the only parameters that affect factory presets. Nothing else can be changed in factory presets by the user.
- User programmable application presets can also be affected by parameters found in Preset Program and Custom Display. These parameters can customize the preset within an exam category or every user preset within an exam category.
- For additional flexibility, the first 9 pages of the Custom Display parameters are specific to the probe in use.

Decreased setup time and increased productivity can be accomplished by establishing an application preset for types of studies that are frequently performed by customizing all parameters to values that are normally used at the start of an exam.

Overview (cont'd)

Each parameter may be affected by a change in exam category, user preset, or probe. Each parameter description in this section is coded to show how it is affected. The codes are as follows:

EC	Exam Category dependent
UP	User Preset dependent
P	Probe dependent
R	Reset to preset value with new patient selection.

NOTE: Doppler and CFM related parameters are not effected in the LOGIQ™ 400 B/W system without the Doppler and CFM option.

Custom Display

Overview

Custom Display in the Set Up Top Menu is 18 pages of preset parameters that are exam category/preset name dependent. The first 9 pages are also probe dependent within the exam category and preset name. The last 9 pages detail mode-specific items for the exam category/preset name.

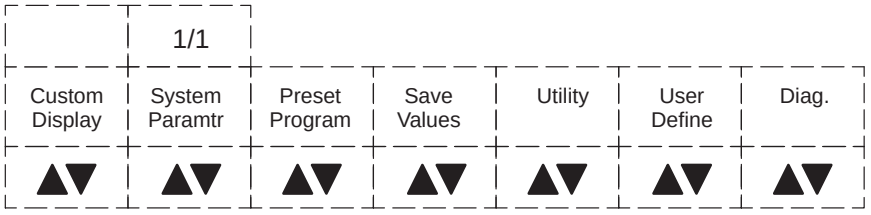


Figure 14–3. Setup Sub-Menus

A brief description of each preset parameter and the choices available for that preset follows.

*NOTE: If it is necessary to quickly return to the Custom Display Sub-Menu page 1, press **Ctrl** and **1** simultaneously.*

Refer to 14–6 for the key to the codes used to describe each parameter's affect.

Parameter Menu Command Lines

An example of a Custom Display parameter menu is shown in Figure 14–4.

Figure 14–4. Custom Display Menu

The top protected lines show the date, time, hospital name and active probe. The next four lines provide information about the menu displayed plus commands to manipulate the menu pages and parameters.

Command line 1

This line shows the parameter categories available with the current one highlighted. The categories listed are:

- User Parameters is not active at this time.
- System Parameters has 7 pages of programmed parameters.
- Preset Program has 10 pages of programmable parameters.
- Custom Display has 18 pages of programmable parameters.

Command line 2

This line shows the exam category and application preset name.

Command line 3

This line shows the menu page displayed (1/18 is page one of eighteen).

PRIOR will display the previous menu page. NEXT will display the following menu page. CONTENTS will show a summary of all Custom Display pages.

- Use the **Trackball** to place the arrow cursor on PRIOR or NEXT.
- Press **Set** to change menu pages.

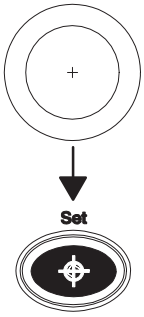
Command line 4

This line lists 4 commands that affect the parameters in the category displayed. They are:

SAVE	is used to save any preset parameter change(s).
RESET	if parameters were changed after the SAVE function was used, RESET will return those parameters to the saved values.
DELETE	is used to erase the currently displayed user preset. Factory presets cannot be erased.
EXIT	returns the system to the last scan mode. Parameter changes will only be temporary if they were not saved before exiting.

Changing a Parameter Value

To change a parameter value:

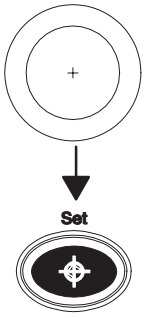


Trackball the arrow cursor to the desired parameter.

Press **Set** to highlight the choice.

If the parameter lists several values, **Trackball** the arrow cursor to the desired value and press **Set**.

If the parameter needs the value to change, use the **Ellipse** up/down arrow keys to increase or decrease the value.



When the desired value is selected or changed, **Trackball** the arrow cursor to SAVE.

Press **Set**.

A prompt at the bottom of the screen asks:

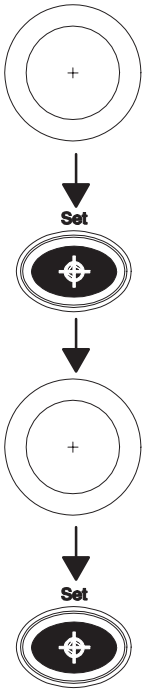
“Overwrite Existing Data? ‘y’ or ‘n’”.

Press ‘y’ to save the new values for the preset displayed.

Press ‘n’ and the prompt “Input User Preset Number (1–8)” appears. Enter the desired number.

NOTE: If no is selected to overwrite current data, the system is asking to make a new user application preset. The eight available spaces are displayed by selecting the preset top menu.

Changing a Parameter Value (cont'd)



To customize the name of the new preset (1–8):

Trackball to the preset name in command line 2.

Press **Set**. Type in the personalized preset name.

Trackball to Save.

Press **Set**. All parameter data is saved as a new preset.

Hints

- Parameters on all of the menu pages can be customized before selecting Save.
- Parameter changes will be lost if Save is not selected.
- A maximum of 8 user exam application presets can be saved.
- Only a change in System Parameters will affect factory presets.

Custom Display Contents

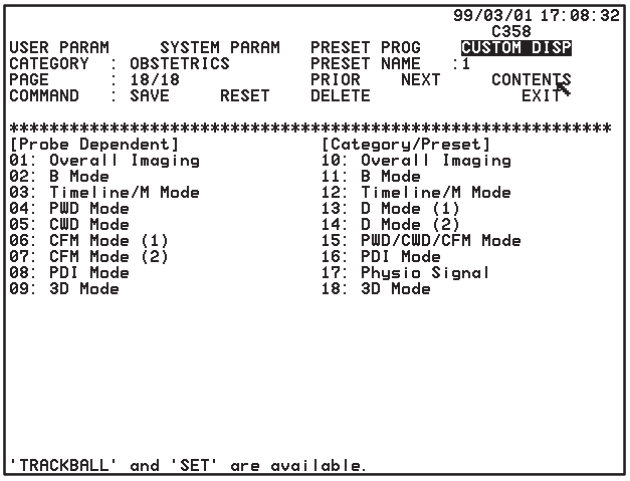


Figure 14–5. Custom Display Contents Page

The custom display contents page shows a summary of the 18 menu pages.

Note that the first 9 pages of presets are probe dependent as well as category/preset dependent like the last 9 pages.

The 3D Mode menus (listed on pages 9 and 18) are available with the option installed.

Trackball the cursor to the desired page and press **Set**.

Page 1 of 18 (Imaging Parameter 1 – Probe Dependent 1)

Enter Depth	**EC, UP, P, R**
	Choose the desired default display depth for the probe indicated. 4, 5, 6, 7, 8, 10, 12, 14, 16, 18, 20, 22 or 24 cm.
Focus Depth [mm]	**EC, UP, P, R**
	Choose the desired default focus depth for the probe indicated. Depth from 1 to 240 mm in 1 mm increments.
Image Rotation	**EC, UP, P, R**
	Choose the desired default image orientation. 0 (N) Normal top to bottom orientation. 90 (W) 90˚ left to right orientation. 180 (S) Inverted bottom to top orientation. 270 (E) 270˚ right to left orientation.
Image Reverse	**EC, UP, P, R**
	Choose the initial default setting of image reverse (left-right orientation). On or Off.
Zoom Auto Start	**EC, UP, P**
	Choose to automatically place the image into the zoom mode after a probe selection change. Off No auto zoom at probe change. On Auto zoom mode at probe change.
Zoom Reference	**EC, UP, P**
	Choose the zoom reference image default setting. On or Off.
Zoom Factor	**EC, UP, P, R**
	Choose the default zoom factor for the read (freeze) zoom. 1.0, 1.2, 1.5, 2.0, 2.5, 3.0 or 4.0.

Page 1 of 18 (Imaging Parameter 1 – Probe Dependent 1) (cont'd)

Standoff Setting EC, UP, P

Choose a setting for the type of probe standoff, if used, for the 739L or L764 (LH) probes. When any other probe is selected the preset is "Not Available".

Off (No standoff), WP (Water path) or CPL (Couplant)

Needle Guide Type EC, UP, P

Choose the type of biopsy guidezone to be displayed for the guide attachment used. For most probes, choose either Single Fixed Angle (SGL) or Multi Angle (MBX). For the E721/MTZ, the probe guidezone choices are:

TV0° Reusable metal guide with a 0 degree offset angle.
TR5° Civco disposable guide with a 5 degree offset angle.

Guide Attachment	Needle Guide Type Setting	Biopsy Zone Soft Menu Choices
Multi Angle Attachment	MBX	MBX1, MBX2, MBX3, OFF
Fixed Angle Attachment	SGL	SGL, OFF
E721/MTZ Metal Guide	TV0°	TV0°, OFF
E721/MTZ Disposable Guide	TR5°	TR5°, OFF
ERB7 Disposable Guide	BX	1~8, OFF
ERB7 Needle Placement Guide	GBX	GBX, OFF

DANGER

Failure to match the guidezone displayed to the guide may cause the needle to track a path outside the displayed zone.

It is extremely important that when using the adjustable angle biopsy guides, the angle displayed on the screen matches the angle set on the guide, otherwise the needle will not follow the displayed guidezone which could result in repeated biopsies or patient injury.

Acoustic Power B/M [%] EC, UP, P, R

Set the initial percentage of acoustic power to be used when in B- or B/M-Modes.

Percentage from 0 to 100% in 10% increments.

Acoustic Power D/CFM/PDI [%] EC, UP, P, R

Set the initial percentage of acoustic power to be used when in Doppler, Color Flow or Power Doppler imaging modes.

Percentage from 0 to 100% in 10% increments.

Page 2 of 18 (Imaging Parameter 2 – Probe Dependent 2)

B Gain EC, UP, P, R

Choose the default gain value for B-Mode.

Value from 0 to 98 in 2 digit increments. The maximum value is probe dependent and may not reach 98.

B Dynamic Range EC, UP, P, R

Choose the default dynamic range value for B-Mode.

Value from 30 to 90 in 6 digit increments.

B Edge Enhance EC, UP, P, R

Choose the default edge enhancement value for B-Mode.

Off, Low, Mid or High.

B Image Softener EC, UP, P, R

Choose the B-Mode image softener function default.

On or Off.

B Softener Level EC, UP, P, R

Choose the B-Mode image softener default level.

D1, D2, D3, Low, Mid or High.

B Frame Average EC, UP, P

Choose the B-Mode frame averaging default value.

Off (no frame averaging), 1, 2, 3, 4, 5 or 6.

B Image Frequency EC, UP, P, R

Choose the B-Mode image frequency optimization setting.

Normal	Compromise between resolution and penetration.
Resolution	Process image for best resolution.
Penetration	Process image for penetration.
Further Penetration	**C358 Probe Only**—Process image for more penetration.
Harmonic1	**3S, S222, S317 and C358 Probes Only**—Process image with tissue harmonic frequency.
Harmonic2	**3S, S222, S317 and C358 Probes Only**—Process image with tissue harmonic frequency.

The soft menu display shows this parameter as an imaging frequency depending on the active probe.

Page 2 of 18 (Imaging Parameter 2 – Probe Dependent 2) (cont'd)

B Gray Scale Map	**EC, UP, P, R**
	Choose the B-Mode gray scale default map.
	1, 2, 3, 4, 5, 6, 7, 8, 9,10, 11, 12, 13, 14, 15 or 16.

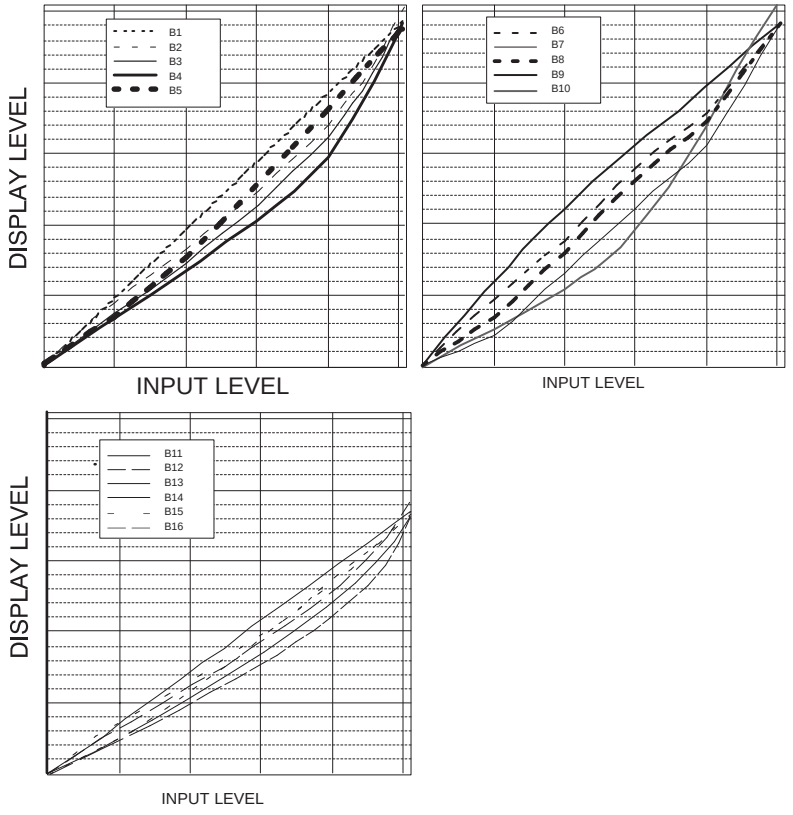


Figure 14–6. Gray Scale Map Graphs

Page 2 of 18 (Imaging Parameter 2 – Probe Dependent 2) (cont'd)

B Rejection EC, UP, P, R	
	Choose the B-Mode rejection default level. Level from 0 to 40 in 1 digit increments.
B Focus Combi Number EC, UP, P, R	
	Choose the default number of focus points in B-Mode. 1, 2 or 3.
B Combi Focus Width EC, UP, P	
	Choose the default width between focus points in B-Mode. Narrow Focal points close together. Normal Focal point at nominal distance. Wide Focal points far apart. Range Improves near field resolution as well as that of the transmit focal zone set by 'Focus Position'. Maximum number of displayed, moveable focus markers is 3.
B Angle/Width [deg, mm] EC, UP, P, R	
	Choose the amount of the scan angle to display as a default for B-Mode. The amount or degrees available depends on the probe.
B Target Frame Rate EC, UP, P	
	Choose the default value for B-Mode frame rate. Low Low frame rate, better resolution. Mid Mid range frame rate and resolution. High Higher frame rate, less resolution.

Page 3 of 18 (Imaging Parameter 3 – Probe Dependent 3)

Timeline Sweep Speed EC, UP, P, R

Choose the default value for the timeline (M-Mode and Doppler spectrum) sweep speed.

Slow	16 microseconds per pixel
Mid	8 microseconds per pixel
Fast	4 microseconds per pixel
Very-Fast*	2 microseconds per pixel

* Works with Doppler only, not M-Mode or M/D-Modes.

Physio Sweep Speed on B EC, UP, P, R

Choose the default value for the physio signal sweep speed displayed on the B-Mode image.

Slow	16 microseconds per pixel
Mid	8 microseconds per pixel
Fast	4 microseconds per pixel

M Gain (Delta from B) EC, UP, P, R

Choose the default value for M-Mode gain difference from the B-Mode Gain.

Value from –98 to 98 in 2 digit increments.

M Dynamic Range EC, UP, P, R

Choose the M-Mode dynamic range default value.

Value from 30 to 90 in 6 digit increments.

M Edge Enhance EC, UP, P, R

Choose the M-Mode edge enhancement default level.

Off, Low, Mid or High.

M Image Frequency EC, UP, P, R

Choose the M-Mode image frequency optimization setting.

Normal	Compromise between resolution and penetration.
Resolution	Process image for best resolution.
Penetration	Process image for penetration.
Further Penetration	**C358 Probe Only**—Process image for more penetration.
Harmonic1	**3S, S222, S317 and C358 Probes Only—**Process image with tissue harmonic frequency.
Harmonic2	**3S, S222, S317 and C358 Probes Only—**Process image with tissue harmonic frequency.

This parameter is not selectable from the soft menu.

Page 3 of 18 (Imaging Parameter 3 – Probe Dependent 3) (cont'd)

M Gray Scale Map	**EC, UP, P, R**
	Choose a M-Mode gray scale default map.
	1, 2, 3, 4, 5, 6, 7, 8, 9 or 10.
M Rejection	**EC, UP, P, R**
	Choose the M-Mode rejection default level.
	Level from 0 to 40 in 2 digit increments.
M Peak Hold	**EC, UP, P, R**
	Choose the default M-Mode peak hold function status.
	On or Off.

Page 4 of 18 (Imaging Parameter 4 – Probe Dependent 4)

PWD/CFM/PDI Penetration EC, UP, P, R	
	Choose to have the default for penetration, using the lower probe frequency, for pulsed Doppler, color flow mapping and power Doppler imaging modes on or off.
	Off Use higher probe frequency. On Use lower probe frequency.
PWD/CFM/PDI Slant Auto Start EC, UP, P, R	
	Choose the default position of the slant scan window.
	Off Vertical (no slant) Other-Side Slanted away from the probe orientation mark Marker-Side Slanted toward the probe orientation mark
PWD Gain EC, UP, P, R	
	Choose the default gain value for pulsed Doppler Mode.
	Value from 0 to 32 in 2 digit increments.
PWD Dynamic Range EC, UP, P, R	
	Choose the default dynamic range value for pulsed Doppler Mode.
	Value from 18 to 48 in 6 digit increments.
PWD Sample Volume [mm] EC, UP, P, R	
	Choose the default pulsed Doppler sample volume cursor size (in millimeters).
	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14 or 16.
PWD Gray Scale Map EC, UP, P, R	
	Choose the pulsed Doppler Mode gray scale default map.
	1, 2, 3, 4, 5, 6, 7, 8, 9 or 10.
PWD Rejection EC, UP, P, R	
	Choose the pulsed Doppler Mode rejection default level.
	Level from 0 to 40 in 2 digit increments.
PWD Velocity [cm/s] EC, UP, P, R	
	Choose the pulsed Doppler Mode velocity scale default value.
	Value from 10 to 1000 in 10 digit increments.
PWD Wall Filter [cm/s] EC, UP, P, R	
	Choose the pulsed Doppler Mode wall filter default value.
	0.3, 0.5, 0.7,1.0, 1.5, 2.0, 3.0, 5.0, 7.0, 10, 15, 20, 30 or 50.

Page 4 of 18 (Imaging Parameter 4 – Probe Dependent 4) (cont'd)

PWD Alternative Scan	**EC, UP, P**
	Choose the action of the B-Pause key while in PWD Mode.
	On — Pressing B-Pause toggles between B-Mode frozen/PWD real-time or B-Mode real-time/PWD frozen. Off — Pressing B-Pause freezes or unfreezes the B-Mode image only.
PWD/CWD Flow Angle [deg]	**EC, UP, P, R**
	Choose the default for the Doppler flow θ angle. Value from -80 to +80 in 5° increments.
CFM/PWD Ratio in Triplex	**EC, UP, P, R**
	Choose the velocity ratio between the CFM display and Pulsed Doppler. 1/1 — Same velocity display. 1/2 — Pulsed Doppler velocity 2 times CFM. 1/4 — Pulsed Doppler velocity 4 times CFM.
PDI/PWD Ratio in Triplex	**EC, UP, P, R**
	Choose the velocity ratio between the PDI display and Pulsed Doppler. 1/1 — Same velocity display. 1/2 — Pulsed Doppler velocity 2 times PDI. 1/4 — Pulsed Doppler velocity 4 times PDI.
CFM/PDI Shrink in Triplex	**EC, UP, P, R**
	Choose to turn CFM/PDI shrink function on or off. Allows for shrinking of the CFM/PDI window to a specified value to improve frame rate. On or Off.
CFM/PDI Shrink Angle/Width [deg, mm]	**EC, UP, P, R**
	Choose the shrink value for the CFM/PDI window in degrees for convex and sector probes or millimeters for linear probes. Value range depends on probe type.

Page 5 of 18 (Imaging Parameter 5 – Probe Dependent 5)

CWD Gain EC, UP, P, R	
	Choose the default gain value for continuous wave Doppler Mode. Value from 0 to 32 in 2 digit increments.
CWD Dynamic Range EC, UP, P, R	
	Choose the continuous wave Doppler Mode dynamic range default value. Value from 18 to 48 in 6 digit increments.
CWD Gray Scale Map EC, UP, P, R	
	Choose the continuous wave Doppler Mode gray scale default map. 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10.
CWD Rejection EC, UP, P, R	
	Choose the continuous wave Doppler Mode rejection default level. Level from 0 to 40 in 2 digit increments.
CWD Velocity [cm/s] EC, UP, P, R	
	Choose the continuous wave Doppler Mode velocity scale default value. Value from 10 to 1000 in 10 digit increments.
CWD Wall Filter [cm/s] EC, UP, P, R	
	Choose the continuous wave Doppler Mode wall filter default value. 0.3, 0.5, 0.7, 1.0, 1.5, 2.0, 3.0, 5.0, 7.0, 10, 15, 20, 30 or 50.

Page 6 of 18 (Imaging Parameter 6 – Probe Dependent 6)

CFM Color Threshold EC, UP, P, R

Choose a priority level for B-Mode display during CFM mode. The higher the number, the greater the emphasis on CFM Mode (color) verses B-Mode (gray scale).

Level from 0 to 100 in 1 digit increments.

CFM Threshold Velocity EC, UP, P, R

Choose the level above which color will no longer be used to display velocity.

Level from 0 to 25 in 1 digit increments.

CFM Threshold Turbulence EC, UP, P, R

Choose the level above which color will no longer be used to display turbulence.

Level from 0 to 100 in 1 digit increments.

CFM Wall Echo Canceller EC, UP, P, R

Choose the initial default setting of the wall echo cancel function.

On or Off.

CFM/PDI Spatial Filter EC, UP, P

Choose the desired amount of averaging between color pixels.

Off, 1, 2, 3, 4, or 5.

CFM Target Frame Rate EC, UP, P

Choose the desired frame rate range while in CFM mode.

Density	Lowest frame rate for high color density
Low	Low frame rate for CFM.
Mid	Medium frame rate for CFM.
High	High frame rate for low color density.

CFM Target Frame Rate Dtl EC, UP, P

Choose the desired frame rate range while in the Detail (Dtl) Mode of CFM presentation.

Density	Lowest frame rate for high color density
Low	Low frame rate for CFM Detail Mode.
Mid	Medium frame rate for CFM Detail Mode.
High	High frame rate for CFM Detail Mode.

CFM Packet Size Survey, Map, SrvyDtl and MpDtl EC, UP, P

Choose the default packet size for each CFM diagnostic mode display. This will be for Survey Mode, Map Mode, Survey-Detail Mode and Map-Detail Mode.

Very-Small	Very Small packet size.
Small	Small packet size.
Mid	Medium packet size.
Large	Large packet size.

NOTE: The larger the packet size, the better the color presentation but with a slower frame rate.

Page 6 of 18 (Imaging Parameter 6 – Probe Dependent 6) (cont'd)

CFM Velocity [cm/s] EC, UP, P, R	
	Choose the default CFM velocity scale in centimeters per second. Value from 0 to 1000 in 10 digit increments.
CFM B Gain EC, UP, P, R	
	Choose the default B-Mode gain setting while in CFM Mode. Value from 0 to 31 in 1 digit increments.
CFM B High Resolution EC, UP, P, R	
	Choose the initial default setting of the high resolution function in CFM Mode. On or Off.
CFM B Frame Average EC, UP, P, R	
	Choose the level of frame averaging for CFM while in combination B-Mode with CFM. Off — No B-Mode frame averaging. Low — Low frame averaging. Mid — Medium frame averaging. High — High frame averaging.
CFM B Wall Filter EC, UP, P, R	
	Choose the default level of wall filtering for B-Mode while in CFM. Low, M1, M2, M3, M4 and High.
CFM B Angle/Width [deg, mm] EC, UP, P, R	
	Choose the default B-Mode angle or width of the display while in CFM. Value from 1 to 124 in one digit increments. Maximum is determined by the probe type.
CFM/PDI Start Depth [mm] EC, UP, P, R	
	Set the start depth of the CFM/PDI window area. Depth in millimeters ranging from 0 to 230.
CFM/PDI Vertical Size [mm] EC, UP, P, R	
	Set the vertical size of the CFM/PDI window. Size in millimeters ranging from 10 to 240.
CFM/PDI Focus Depth [%] EC, UP, P, R	
	Set the desired depth of the focal zone in CFM/PDI Mode window. Percentage ranging from 0 to 100.

Page 7 of 18 (Imaging Parameter 7 – Probe Dependent 7)

CFM M Gain (Delta from B) **EC, UP, P, R**	
	Choose the default level for M-Mode gain while in CFM. Level from –31 to 31 in 1 digit increments.
CFM M Wall Filter **EC, UP, P, R**	
	Choose the default level for the M-Mode Wall Filter while in CFM Mode. Low, M1, M2, M3, M4, or High.
CFM ACE **EC, UP, P, R**	
	Choose the default setting for Adaptive Color Enhancement, which reduces clutter noise or color flash. On or Off.
CFM Noise Blanker **EC, UP, P, R**	
	Choose the default setting for Noise Blanker, which reduces random color noise. OFF, LOW, MID or HIGH.
CFM Persistence **EC, UP, P, R**	
	Choose the default setting for Persistence, which retains highest color pixel value for a specified period of time or until a higher value is detected. OFF, SHORT, MID or HIGH.
CFM Map Transparency **EC, UP, P**	
	Choose the default CFM Transparency map. The higher the number, the more transparent the map. Off, 1, 2, 3, or 4
PDI Map Transparency **EC, UP, P**	
	Choose the default PDI Transparency map. The higher the number, the more transparent the map. Off, 1, 2, 3, or 4

Page 8 of 18 (Imaging Parameter 8 – Probe Dependent 8)

PDI Color Threshold EC, UP, P, R

Choose a priority level for B-Mode display during PDI mode. The higher the number, the greater the emphasis on B-Mode verses PDI Mode.

Choose 0 to 100 in 1 digit increments.

PDI Threshold Power EC, UP, P, R

Set the threshold value (%) at which power information will start to be displayed.

Set from 0 to 50 percent.

Example: Setting = 20%; Power values less than 20% will not be displayed. They will be set to the background color. Only power values over 20% will be displayed as color.

PDI Target Frame Rate EC, UP, P

Choose the desired frame rate range while in PDI mode.

Density	Lowest frame rate for high color density
Low	Low frame rate for PDI.
Mid	Medium frame rate for PDI.
High	High frame rate for PDI.

PDI Target Frame Rate Dtl EC, UP, P

Choose the desired frame rate range while in the Detail (Dtl) Mode of PDI presentation.

Density	Lowest frame rate for high color density
Low	Low frame rate for PDI Detail Mode.
Mid	Medium frame rate for PDI Detail Mode.
High	High frame rate for PDI Detail Mode.

PDI Packet Size Survey, Map, SrvyDtl and MpDtl EC, UP, P

Choose the default packet size for each PDI diagnostic mode display. This will be for Survey Mode, Map Mode, Survey-Detail Mode and Map-Detail Mode.

Very-Small	Very Small packet size.
Small	Small packet size.
Mid	Medium packet size.
Large	Large packet size.

NOTE: The larger the packet size the better the color presentation but with a slower frame rate.

PDI Velocity [cm/s] EC, UP, P, R

Choose the default PDI velocity scale in centimeters per second.

Value from 0 to 1000 in 10 digit increments.

PDI B Gain EC, UP, P, R

Choose the default B-Mode gain setting while in PDI Mode.

Value from 0 to 31 in 1 digit increments.

PDI B High Resolution EC, UP, P, R

Choose the initial default setting of the high resolution function in PDI Mode.

On or Off.

Page 8 of 18 (Imaging Parameter 8 – Probe Dependent 8) (cont'd)

PDI B Frame Average EC, UP, P, R

Choose the level of frame averaging for B-Mode while in PDI.

Off	No B-Mode frame averaging.
Low	Low frame averaging.
Mid	Medium frame averaging.
High	High frame averaging.

PDI B Wall Filter EC, UP, P, R

Choose the default level of wall filtering for B-Mode while in PDI.

Low, M1, M2, M3, M4 and High.

PDI M Gain (Delta from B) EC, UP, P, R

Choose the default level for M-Mode gain while in PDI.

Level from –31 to 31 in 1 digit increments.

PDI M Wall Filter EC, UP, P, R

Choose the default level for the M-Mode Wall Filter while in PDI Mode.

Low, M1, M2, M3, M4, or High.

PDI ACE EC, UP, P, R

Choose the default setting for Adaptive Color Enhancement, which reduces clutter noise or color flash.

ON or OFF.

PDI Noise Blanker EC, UP, P, R

Choose the default setting for Noise Blanker, which reduces random color noise.

OFF, LOW, MID or HIGH.

PDI Persistence EC, UP, P, R

Choose the default setting for Persistence, which retains highest color pixel value for a specified period of time or until a higher value is detected.

OFF, SHORT, MID or HIGH.

Page 9 of 18 (Imaging Parameter 9)

3D Aspect Ratio EC, UP, P, R	
	Choose the ratio between depth and width in 3D-Mode. Depth is the first number. Width is the second number. 2/1, 1/1, 1/2, 1/3, 1/4 or 1/5.
3D Swing Angle [deg] EC, UP, P	
	Choose the swinging angle of the MIP image display. Angle from 5 to 60 degrees in 5 degree increments.
3D Swing Center [%] EC, UP, P	
	Choose the center position to swing the MIP image display. Percentage from 0 to 100% in 10% increments.
3D View Direction EC, UP, P, R	
	Choose the viewpoint for the construction of the MIP images when in 3D-Mode. Normal or Reverse.

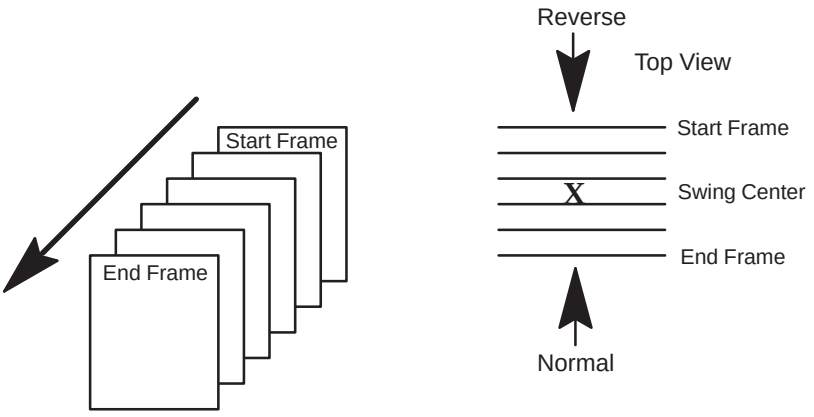


Figure 14–7. MIP Image Principles

CAUTION

The marker that indicates the viewpoint for the MIP image is displayed on the left side of the monitor.

Normal is indicated by the marker “ ↗ ↑ ↖ ”.
Reverse is indicated by the marker “ ↘ ↓ ↙ ”.

Ensure that this marker is consulted for MIP image viewpoint.

Page 10 of 18 (Imaging Parameter 10)

Image Mode EC, R

Choose the default imaging mode for this preset.

B	B-Mode only
B/B	Dual B-Mode
B/M	B- and M-Modes
B/D	B- and Doppler Modes
CFM-B	B-Mode with Color Flow
CFM-B/B	B-Mode with Color Flow and B-Mode
CFM-B/M	B- and M-Modes with Color Flow
CFM-B/D	B- and Doppler Modes with Color Flow

Acoustic Power Control by Audio Volume EC

Set how the Acoustic Output will affect the scan image with the Audio Volume knob.

Both B and D—In case of B-, B/M-, M-Mode, Audio Volume knob can adjust B-, B/M-, M-Mode Acoustic Power. When changing to Doppler or CFM Mode after acoustic power has been adjusted with the Audio Volume control, the acoustic power setting remains the same. It does not revert back to the factory or preset default.

Only B—Acoustic Power for B-, B/M-, or M-Mode can be adjusted when the mode is B-, B/M- or M-Mode only. When Doppler or CFM Mode is activated, the acoustic output setting reverts back to the factory or preset default.

No Effect—Audio Volume knob has no effect on changing Acoustic Power.

Displayed TI EC

Choose the type of thermal index display.

TIS	Thermal Index – Soft Tissue
TIC	Thermal Index – Cranial Bone
TIB	Thermal Index – Bone

Image Gamma [%] EC, UP

Choose the level of gamma correction applied to the image during photography.

Choose from 50 to 200 in 5 digit increments.

Auto Focus Control EC

Choose to have the focus control follow depth changes as a percent of depth or have the focus depth be a fixed value.

On	Focus is a percent of the current depth (Focus Pos % Depth preset) until changed by focus position.
Off	Focus is at a fixed depth until changed by focus position control (Focus Depth [mm] Preset).

Zoom Reference Update EC, UP

Choose to update timing of reference image in Zoom.

Off	No reference update,
0.5s, 1.0s, or 2.0s	Update at time interval selected.

TGC Depth Remap EC

Choose the default setting for the TGC graphic to be recomputed and displayed when parameters are changed.

On or Off.

Page 10 of 18 (Imaging Parameter 10) (cont'd)

Cine Gauge Auto Display EC

Choose the initial default setting for the Cine gauge to be displayed when Cine is activated.

On or Off.

Cine Speed EC, R

Choose the default Cine loop playback speed.

1, 1/2, 1/4, 1/8 or 1/16.

Image Back Color EC, UP

Choose the image area background color.

BLK	Black	DRD	Dark Red
GR1	10% Gray	BDX	Bordeaux Red
GR2	20% Gray	GGR	Green Gray
GR3	30% Gray	DGR	Dark Green

Frame Rate Display EC

Choose the default setting of the frame rate display on the screen.

On or Off.

Probe Direction Mark Display EC

Choose the default setting of the probe direction marker display.

On or Off.

Audio Tone Equalizer EC

Choose the desired type of audio output response

Flat	Normal setting
1	Reduced high tones, increased mid tones
2	Reduced high tones, increased mid/low tones
3	Reduced high tones, increased mid tones

	Bass	Mid	Treble
Flat	0db	0db	0db
1	0db	2db	-4db
2	2db	2db	-2db
3	0db	4db	-2db

Display TGC Curve EC

Choose the default setting of the TGC Curve display for both large and small image format.

On or Off.

Page 11 of 18 (Imaging Parameter 11)

B Focus Dual Marker EC, UP	
	Choose to display focus markers on both dual B-Mode images or just to the right side of the right image. Off Only one focus marker is displayed. On Focus markers will be displayed to the right of both the right and left images.
B Color Auto Start EC, R	
	Choose the initial default setting for B color (colorized gray scale). On or Off.
B Color Map EC, UP	
	Choose a B color default map. 1, 2, 3, 4, 5 or 6.
B Tag Auto Start EC, R	
	Choose the initial default setting for B color tag. On or Off.
B Tag Center [%] EC, R	
	Choose the center point of the B color tag window as a default. Percentage from 0 to 100%. A percentage of the entire displayed B color window (colorized gray scale).
B Tag Width [%] EC, R	
	Choose a default for the desired B color tag width. Percentage from 0 to 100% for the B color window size.
B Format B Single EC	
	Choose a default display size for a single B-Mode image. Large or small.
B Format B Dual EC	
	Choose a default display size for a dual B-Mode image. Large or small.
B Scale Mark EC	
	Choose as a default what the scale markers will represent in B-Mode. Depth/Width Depth and width marks. Depth Depth marks only. Comb Combination mode.
B Video Inverse EC	
	Choose as a default how to display B-Mode video. Off White on black. On Black on white.

Page 12 of 18 (Imaging Parameter 12)

Timeline Sweep Method EC	
	Choose as a default between two types of timeline presentations. Scroll — Continuous update at edge of the screen. Moving-Bar — Timeline is updated by a bar moving across the screen.
Timeline Format EC	
	Choose as a default how the timeline (M-Mode or Doppler spectrum) will be displayed. Only one type of display format is available at one time. Side/Side — B-Mode on left half of the display and the timeline on the right half. Top/Bottom — B-Mode on the top of the display and the timeline across the bottom.
Auto B Melt at Unfreeze EC, UP	
	When the B Pause function is used to freeze B-Mode while in B/M or B/D, the preset sets the default to have the B-Mode image remain paused when the system is unfrozen. Off — B-Mode remains paused at unfreeze. On — B-Mode exits pause condition at unfreeze.
M Mode Simul PD Activity EC	
	Choose as a default to have the ability to display simultaneous M-Mode and pulsed Doppler spectrum. Off — No simultaneous M and PD display. On — Simultaneous display capable.
M Color Auto Start EC, R	
	Choose the initial default setting for M color (colorized gray scale). On or Off.
M Color Map EC, UP	
	Choose a M color default map. 1, 2, 3, 4, 5 or 6.
M Tag Auto Start EC, R	
	Choose the initial default setting for M color tag. On or Off.
M Tag Center [%] EC, R	
	Choose the center point of the M color tag window as a default. Percentage from 0 to 100%. A percentage of the entire displayed M color window (colorized gray scale).

Page 12 of 18 (Imaging Parameter 12) (cont'd)

M Tag Width [%] EC, R	
	Choose a default for the desired M color tag width. Percentage from 0 to 100% for the M color window size.
M Format (Side/Side, Full) EC	
	Choose the default size for the M-Mode display format when it is full screen or side by side. Side/Side must be selected for "Timeline Format" on the Set Up/Custom Display Menu page 12 in order to display this format. Large or small.
M Mode FULL B + Cursor EC	
	Choose the default setting for the full B plus M-Mode cursor display format. On or Off.
M Mode Side/Side B Large EC	
	Choose the default setting for the large B-Mode (left side) and M-Mode (right side) format. Side/Side must be selected for "Timeline Format" on the Set Up/Custom Display Menu page 12 in order to display this format. On or Off.
M Mode Side/Side B Small EC	
	Choose the default setting for the small B-Mode (left side) and M-Mode (right side) format. Side/Side must be selected for "Timeline Format" on the Set Up/Custom Display Menu page 12 in order to display this format. On or Off.
M Mode Top/Bottom B Large EC	
	Choose the default setting for the large B-Mode (top) and M-Mode (bottom) format. Top/Bottom must be selected for "Timeline Format" on the Set Up/Custom Display Menu page 12 in order to display this format. On or Off.
M Mode Top/Bottom B Mid EC	
	Choose the default setting for the medium size B-Mode (top) and M-Mode (bottom) format. Top/Bottom must be selected for "Timeline Format" on the Set Up/Custom Display Menu page 12 in order to display this format. On or Off.

Page 12 of 18 (Imaging Parameter 12) (cont'd)

M Mode Top/Bottom B Small EC	
	Choose the default setting for the small size B-Mode (top) and M-Mode (bottom) format. Top/Bottom must be selected for "Timeline Format" on the Set Up/Custom Display Menu page 12 in order to display this format. On or Off.
M Mode Full M EC	
	Choose the default setting for the full screen M-Mode format. On or Off.
M Scale Mark EC	
	Choose the method to display scale markers in M-Mode. Time/Depth Time horizontal and depth vertical. Time Time horizontal only.
M Video Inverse EC	
	Choose the display video type for the M-Mode portion of the display. Off White on black (inverse off). On Black on white (inverse on).

Page 13 of 18 (Imaging Parameter 13)

D/CFM Scale Mark EC	
	Choose the default value for the scale markers in Doppler with color flow. Velo Velocity Frq Frequency Velo/Frq Velocity/Frequency Frq/Velo Frequency/Velocity
D Type for Wall Filter EC	
	Choose the type of wall filter display while in Doppler. Velo Velocity Freq Frequency
D Realtime Auto Trace EC, R	
	Choose the initial default setting for the auto trace function during real-time Doppler. Off No Real-time trace function. On Real-time trace function enabled. Calc Real-time trace function with calculation display enabled.

Page 13 of 18 (Imaging Parameter 13) (cont'd)

D Realtime Trace Method EC, R	
	Choose the value that will be traced during real-time Doppler.
	Peak — Peak or highest values (TAMAX). Floor — Bottom or lowest values and peak (TAMIN). Mean — Average values and peak (TAMEAN). Mode — Brightest echo trace and peak (TAMODE).
D Realtime Calc Dir. EC, R	
	Choose the default for the portion of the Doppler signal to be auto traced.
	Compo — Forward and reverse flow. Forwd — Only forward flow. Revrs — Only reverse flow.
D Color Auto Start EC, R	
	Choose the initial default setting for D color (colorized gray scale).
	On or Off.
D Color Map EC, UP	
	Choose a D color default map.
	1, 2, 3, 4, 5 or 6.
D Tag Auto Start EC, R	
	Choose the initial default setting for D color tag.
	On or Off.
D Tag Center [%] EC, R	
	Choose the center point of the D color tag window as a default.
	Percentage from 0 to 100%. A percentage of the entire displayed D color window (colorized gray scale).
D Tag Width [%] EC, R	
	Choose a default for the desired D color tag width.
	Percentage from 0 to 100% for the D color window size.
D Format (Side/Side, Full) EC	
	Choose the default Doppler display size for the side by side or full Doppler formats. Side/Side must be selected for "Timeline Format" on the Set Up/Custom Display Menu page 12 in order to display this format.
	Large, small or very-small.

Page 13 of 18 (Imaging Parameter 13) (cont'd)

D Mode Full B + Cursor EC	
	Choose the default setting for the full B-Mode plus Doppler cursor format display. On or Off.
D Mode Side/Side B Large EC	
	Choose the default setting for the large B-Mode (left side) and Doppler (right side) format. Side/Side must be selected for "Timeline Format" on the Set Up/Custom Display Menu page 12 in order to display this format. On or Off.
D Mode Side/Side B Small EC	
	Choose the default setting for the small B-Mode (left side) and Doppler (right side) format. Side/Side must be selected for "Timeline Format" on the Set Up/Custom Display Menu page 12 in order to display this format. On or Off.
D Mode Top/Bottom B Large EC	
	Choose the default setting for the large B-Mode (top) and Doppler spectrum (bottom) format. Top/Bottom must be selected for "Timeline Format" on the Set Up/Custom Display Menu page 12 in order to display this format. On or Off.
D Mode Top/Bottom B Mid EC	
	Choose the default setting for the medium B-Mode (top) and Doppler spectrum (bottom) format. Top/Bottom must be selected for "Timeline Format" on the Set Up/Custom Display Menu page 12 in order to display this format. On or Off.
D Mode Top/Bottom B Small EC	
	Choose the default setting for the small B-Mode (top) and Doppler spectrum (bottom) format. Top/Bottom must be selected for "Timeline Format" on the Set Up/Custom Display Menu page 12 in order to display this format. On or Off.
D Mode Full D EC	
	Choose the default setting for the full screen Doppler spectrum format. On or Off.

Page 14 of 18 (Imaging Parameter 14)

D Image Processing EC

Choose the desired type of Doppler spectrum image processing.

Black Holes Filling	Reduce the noise in the Doppler spectrum by filling in vertically.
Normal	Standard Processing. No additional filtering to reduce noise.
Smoothing	Reduce the noise in the Doppler spectrum by filling in vertically and horizontally.
Leveling	Reduce the noise for Doppler spectrum direction.

D Time Resolution EC, UP

Choose the amount of emphasis to be placed on Doppler time resolution as compared to frequency resolution.

1 Time resolution much greater than frequency resolution.
2 Time resolution slightly greater than frequency resolution.
3 Frequency resolution slightly greater than time resolution.
4 Frequency resolution much greater than time resolution.
5 Frequency resolution the greatest compared to time resolution.

D Audio to Speaker EC

Choose the default type of Doppler audio to be sent to the speakers.

Stereo	Forward & Reverse signals separate.
Mono–F	Forward signals only.
Mono–R	Reverse signals only.

D Audio Volume [%] EC, R

Choose the default percentage value for the Doppler volume to the speakers.

Percentage from 0 to 100% in 4 digit steps.

D Video Inverse EC

Choose the default type of video used to display the Doppler spectrum.

Off	White on black.
On	Black on white.

Display Dop Frequency EC

Choose the default setting for the Doppler Frequency display.

On or Off.

Display Dop PRF EC

Choose the default setting for the Doppler PRF display on the left side of the monitor.

On or Off.

Page 14 of 18 (Imaging Parameter 14) (cont'd)

Display Spectrm Ref. Value	EC
Choose the default setting for the display of the Doppler velocity increments on the spectrum.	
On	Only Doppler velocity reference scale is displayed.
Off	Only Doppler velocity maximum value is displayed.
Spec. Inv in Triplex	**EC**
Choose the default setting for the color scale bar when Doppler spectrum is inverted.	
Independent	The color scale bar remains the same when the Doppler spectrum is inverted.
Simultaneous	The color scale bar inverts when the Doppler spectrum is inverted.

Page 15 of 18 (Imaging Parameter 15)

PWD Base Line [%] EC, R

Choose the default percentage value for forward pulsed Doppler spectrum display.

Percentage from –75% to +75% in 25% increments (0 is 50% forward and 50% reverse).

CWD Base Line [%] EC, R

Choose the default percentage value for forward continuous wave Doppler spectrum display.

Percentage from –75% to +75% in 25% increments (0 is 50% forward and 50% reverse).

CWD Non-aliasing mode EC

Choose how to process the CWD signal for aliasing.

Off	Non-aliasing mode off.
On	Increase signal to noise ratio to reduce aliasing.

CFM Capture Interval [s] EC, R

Choose the default value (time) for the CFM capture interval.

Off	No time interval update.
1/2	Update at .5 second intervals.
1	Update at 1 second intervals.
2	Update at 2 second intervals.
ECG	Update synchronized with ECG signal.

CFM Velo Dynamic Range EC, UP

Choose the default value for the CFM velocity dynamic range display.

Value from 10 to 100 in 10 digit increments.

CFM/PDI Sequence EC, UP

Use the Ellipse up/down arrow keys to choose the default diagnostic mode sequence for Color Flow Mapping or Power Doppler Imaging.

Srvy>Mp>MpDtl	Survey, map and map/detail.
Srvy>SrvyDtl	Survey and survey/detail.
SrvyDtl>MpDtl	Survey/detail and map/detail.
Srvy>SrvyDtl>Map	Survey, survey/detail and map.

Page 15 of 18 (Imaging Parameter 15) (cont'd)

CFM/PDI Initial Sequence EC	
	Choose the initial default diagnostic mode for Color Flow Mapping or Power Doppler Imaging. Survey, map, survey/detail or map/detail.
CFM Color Map 1, 2, 3, and 4 EC, UP	
	Choose the default color map type for each of the four selection positions in the CFM mode. Map V 1, 2, 3, 4, 5, 6, 7 or 8. (velocity) Map VT 1, 2, 3, 4, 5, 6, 7 or 8. (velocity/turbulence) Map T 1 or 2. (turbulence) Map A 1, 2, 3 or 4. (advanced velocity maps)* * ACE–2 option needed for advanced velocity maps.
CFM Tag Auto Start EC, R	
	Choose the initial default setting for CFM tag. On or Off.
CFM Tag Center [cm/s] EC, R	
	Choose the default center point in cm/sec for the CFM color tag window. Value from 0 to 500.
CFM Tag Width [cm/s] EC, R	
	Choose the default width in cm/sec for the CFM color tag window. Width from 0 to 1000.
CFM Base Line [%] EC, R	
	Choose a default baseline for the CFM color map. –75, –50, –25, 0, 25, 50 or 75.

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CFM/PDI Initial Mode EC, R	
	Choose the default mode for color CFM or PDI. CFM Regular CFM mode. PDI Power Dopper Imaging mode.
PDI B/W Display EC	
	Set the default parameter for the PDI transparent mode Maps 1 and 2. On or Off.
PDI Default Map EC	
	Choose the default color map for the PDI mode. P1, P2, P3, P4, P5, P6, P7 or P8.
PDI Dynamic Range EC, UP	
	Choose the default value for the Power Doppler dynamic range display. Value from 10 to 100 in 10 digit increments.
PDI Tag Auto Start EC, R	
	Choose the initial default setting for PDI tag. On or Off.
PDI Tag Center [cm/s] EC, R	
	Choose the default center point in cm/sec for the PDI color tag window. Value from 0 to 500.
PDI Tag Width [cm/s] EC, R	
	Choose the default width in cm/sec for the PDI color tag window. Width from 0 to 1000.
PDI Capture Interval [s] EC, R	
	Choose the default value (time) for the PDI capture interval. Off No time interval update. .5 Update at .5 second intervals. 1 Update at 1 second intervals. 2 Update at 2 second intervals. ECG Update synchronized with ECG signal.

Page 17 of 18 (Imaging Parameter 17)

ECG Auto Display EC	
	Choose the initial default setting for the ECG waveform to be displayed on the monitor. On or Off.
ECG Gain EC, R	
	Choose the default value for ECG gain. Value from –20 to +10 in 2 digit increments.
ECG Position EC, R	
	Choose the default value for the ECG display position (horizontal). Value from –50 to +50 in 5 digit increments.
ECG Heart Rate Display EC	
	Choose the initial default setting for the heart rate, calculated from the ECG input, to be displayed on the monitor. On or Off.
ECG R Delay 1 [ms] EC, UP, R	
	Choose the default value in milliseconds for the R wave Delay 1. Value from 0 to 2000 in 5 digit increments.
ECG R Delay 1 to 2 [ms] EC, UP, R	
	Choose the default value in milliseconds for the R wave delay between Delay 1 and Delay 2. Value from 0 to 2000 in 5 digit increments.
ECG Audio Beat Sound EC, UP	
	Choose the default setting to represent the ECG input as an audio tone. On or Off.
ECG Audio Beat Sound Tone EC	
	Choose as a default the type of tone to be used to represent the ECG input. Tone-1, tone-2 or tone-3.

Page 17 of 18 (Imaging Parameter 17) (cont'd)

ECG Sync Mark Display EC, UP	
	Choose the default setting for the flashing heart mark display. The heart mark is displayed in sync with the R-wave only when a valid ECG trace is present. On or Off.
PCG Auto Display EC	
	Choose the initial default setting for the PCG input displayed on the monitor. On or Off.
PCG Gain EC, R	
	Choose the default value for PCG gain. Value from –10 to +10 in 2 digit increments.
PCG Position EC, R	
	Choose as a default the horizontal position of the PCG waveform on the display. Value from –50 to +50 in 5 digit increments.
AUX Auto Display EC	
	Choose the initial default setting for the auxiliary signal input to be displayed on the monitor. On or Off.
AUX Gain EC, R	
	Choose the default gain value for the auxiliary input signal. Value from –10 to +10 in 2 digit increments.
AUX Position EC, R	
	Choose as a default the horizontal position of the auxiliary waveform on the display. Value from –50 to +50 in 5 digit increments.

Page 18 of 18 (Imaging Parameter 18)

3D Swing Speed EC, UP, R	
	Choose the swing speed of the displayed MIP image. 1/1, 1/2, 1/4, 1/8 or 1/16 with 1/1 being the fastest swing speed.
3D Scan Line Resolution EC, UP	
	Choose the default setting for 3D-Mode Scan Line Resolution. Normal or High.
3D Number of Frames in Build EC, UP	
	Choose the number of frames to be constructed for the final MIP image. The higher the number the better the 3D resolution but with longer rendering time. Number from 5 to 21 in 2 frame steps.
3D B Percent of Source Frames EC, UP	
	Choose the number of source frames to be used for constructing the B/W MIP image. Number from 1/1, 1/2, 1/3, 1/4 or 1/5.
3D B Projection Technique EC, UP, R	
	Choose the method to be used in constructing the MIP image. Min Minimum Intensity Projection. Max Maximum Intensity Projection. Grad Backward images are faded. Inv Same as Min but the gray levels of the constructed images are inverted.
3D B Gradient Threshold [%] EC, UP	
	Choose the gray level threshold percentage to be used in the B/W Gradient Mode. Percentage from 0 to 100% in 2% increments.
3D B Background Level [%] EC, UP	
	Choose the percentage of the gray level for the background of the B/W MIP images. Percentage from 0 to 100% in 2% increments.
3D B Frame Line Level [%] EC, UP	
	Choose the percentage of the gray level to be used for the frame line of the B/W MIP image. Percentage from 0 to 100% in 2% increments.

Page 18 of 18 (Imaging Parameter 18) (cont'd)

3D CFM/PDI Percent of Source Frames [%] EC, UP *	
	Choose the number of source frames to be used for constructing the CFM MIP image. 1/1, 1/2, 1/3, 1/4 or 1/5.
3D CFM/PDI Projection Technique EC, UP, R *	
	Choose the method to be used in constructing the MIP images. Norm — Normal Maximum Intensity Construction. Grad — Backward images are faded. Shaded — Object's edges are enhanced.
3D CFM/PDI Gradient Threshold [%] EC, UP *	
	Choose the color threshold percentage to be used in the Gradient Mode. Percentage from 0 to 100% in 2% increments.
3D CFM/PDI Shade Object Threshold [%] EC, UP *	
	Choose the color threshold percentage to be used for the construction in Shaded Mode. Percentage from 0 to 100% in 2% increments.
3D CFM/PDI Shade Boundary Threshold [%] EC, UP *	
	Choose the color threshold percentage to be used for the boundary in Shaded Mode. Percentage from 0 to 100% in 2% increments.
3D CFM/PDI Frame Line Level [%] EC, UP *	
	Choose the percentage of the gray level to be used for the frame line of the B/W MIP images. Percentage from 0 to 100% in 2% increments.

** NOTE: 3D images cannot be rendered in PDI-Mode.*

System Parameters

Overview

System Paramtr (parameters) in the Set Up Top Menu is 7 pages of preset parameters that when set, are the same for all exam categories and preset names. Changing system parameters also affects these exam application presets found in factory default menu.

Generally, these items are common to modes, probes, formats and applications.

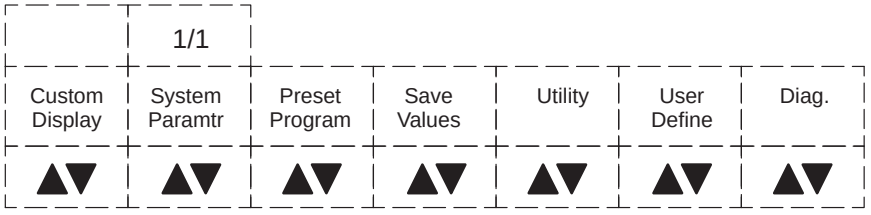


Figure 14–8. Setup Sub-Menu (System Parameters)

A brief description of each preset parameter and the choices available for that preset follows.

*NOTE: If it is necessary to quickly return to page one of the System Parameters Sub-Menus, press **Ctrl** and **1** simultaneously.*

System Parameters Contents

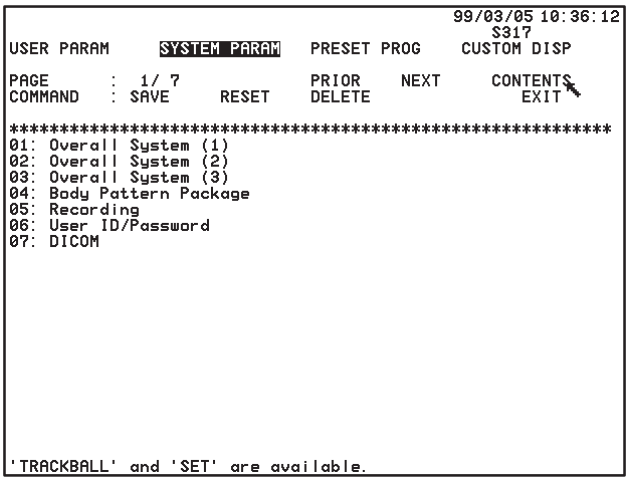


Figure 14–9. System Parameters Contents Page

The System Parameters Contents page shows a summary of the 7 menu pages.

Trackball the cursor to the desired page and press **Set**.

Page 1 of 7 (System Setup)

Hospital Name

Enter the desired hospital or facility name. This appears at the top of all display screens and report pages.

Maximum of 29 alphanumeric characters.

Date Format

Choose the desired presentation format for all dates displayed.

Year/Month/Day, Month/Day/Year, Day/Month/Year

Time Format

Choose the desired presentation format for all time graphics displayed.

24 H	24 hour clock
12 H	12 hour clock

Language

Choose the desired language for all displayed graphics by using the **Ellipse** up/down arrow keys.

English, French, German, Spanish, Italian, Portuguese, Swedish, Danish, Russian, Greek or Turkish.

Diag Category

Choose the desired default diagnostic category.

Rad/Abd	Radiology/Abdomen
Obst	Obstetrical
Gyne	Gynecology
Card	Cardiology
Vasc	Vascular
Urol	Urology
SmlPts	Small Parts

Change Probe and Category

Choose to manually select the desired category with the probe.

Independent	Manual selection of exam category and manual selection of probe.
Simultaneous	When the probe is manually selected, the system automatically defaults to the assumed exam application for that probe.

Report Cursor Blink

Choose to have the report cursor blinking or solid.

Off	Solid
On	Blinking

Report Cursor Type

Choose the style of the report cursor desired.

Underscore

Block

Page 1 of 7 (System Setup) (cont'd)

CUA Selection Reset on New Patient	
	Choose to reset all Composite Ultrasound Age flags on the OB Report pages to yes when New Patient is selected. On or Off.
Insite Access Enable	
	Choose the default setting to access remote diagnostics via telephone line. On or Off.
Keyboard Tab	
	Choose the comment cursor movement desired when using the Tab key. Normal Eight character spaces. Word Next word (after a space).
Operation Error Beep	
	Choose to disable the audio error beep or set the volume of the tone that is heard when a keystroke error is made. Off No error beep. Low Low volume beep on error. Loud High volume beep on error.
Standby Time [min]	
	The system can be set to go into stand-by mode if no keyboard activity is sensed for a specific period of time. 5, 10, 15, 30, 45, 60 minutes or INF (infinity-never)
Power on Memory Test	
	Choose to execute the system memory test at power up. On or Off.
Power on Status	
	The "Keep-Latest" function is not available. The system always resets the Exam/System Parameters at power up, even if "Keep-Latest" is selected. Keep-Latest Not available. Reset Reset to system defaults.
System Error Erase Interval	
	Set the time that a system error message is displayed on the monitor before it is erased. 0.1, 1, 10 minutes or infinity. Infinity is until the next error occurs.

Page 1 of 7 (System Setup) (cont'd)

CRT Menu Auto Erase Interval [sec]
Set the time in seconds that the Top or Sub Menus will be displayed on the monitor before they are automatically erased. Choose from 5, 10, 15, 20 seconds or infinity.
Display Probe Name
Choose to display the names of the probes attached to the console in the soft menu when an available Probe Select key is pressed. On or Off.

Page 2 of 7 (System Setup)

Setup Blue Back Start	
Choose to display a color for the background of the preset menus. Color is set by Col BackGnd.	
Off	Background is transparent.
On	Display a colored background.
Mask Image Characters	
Choose to mask (disable) the graphic characters on the image display.	
On or Off.	
PCG Filter	
Choose the desired level of PCG (Physiological Signal) filtering.	
Low	Low level filtering.
Mid1	Medium level filtering.
Delay Trigger Source	
Choose the source for the cardiac trigger delay.	
ECG	Electrocardiogram input.
AUX	Auxiliary signal input.

Page 2 of 7 (System Setup) (cont'd)

ID/Name Prohibition After Measurement	
	Choose to be able to use the ID/Name Key to change patient information after a measurement has been taken or lockout the use of the ID/Name key after a measurement is taken. Off ID/Name Key functional after measurement. On ID/Name Key not functional after measurement.
BSA Type	
	Choose the formula used to calculate Body Surface Area. Oriental Asian formula. Occidental USA formula.
OB Report Format	
	Choose the format for calculation and display of OB measurements. Tokyo Tokyo University Method. Osaka Osaka University Method. USA United States Method. Europe European Method.
EFBW Form (Europe)	
	Choose the method for calculating estimate fetal birth weight for the European method. Shep/Wars Shepherd/Warshoff Method. Rich/Berk Richards/Berkowitz Method. Hadlock Hadlock Method. German German Accepted Method. Merz German Method
EFBW Form (Tokyo)	
	Choose the formula to be used for calculating the estimate fetal birth weight for the Tokyo method. Tokyo Tokyo University Tokyo–S1 Tokyo Sinozuka EFW1 Tokyo–S2 Tokyo Sinozuka EFW2 Tokyo–S3 Tokyo Sinozuka EFW3
Col BackGnd	
	Choose the color for the background of Preset and Patient Entry menus displayed on the monitor. Color options are: BLK Black GRY Gray ULB Ultramarine Blue BLU Blue PWB Periwinkle Blue MGR Moss Green MNK Mink MRN Maroon

Page 2 of 7 (System Setup) (cont'd)

Col Sys Inf	
	Choose the color for all alphanumeric system information displayed on the monitor. Color options are: WHT White YLW Yellow GRN Green LGR Light Green PBL Pale Blue PNK Baby Pink RED Vermilion YOR Yellow Orange
Col Imag Crs	
	Choose the color for the image characters on the display (Probe Orientation, Zoom Depth, and Image Recall graphics). See color options under *Col Sys Inf.*
Col Scale	
	Choose the color for the scale markers on the display. See color options under *Col Sys Inf.*
Col Comment	
	Choose the color for comments and annotations entered on the display. See color options under *Col Sys Inf.*
Col Mes Crs	
	Choose the color for the fixed measurement cursor on the display. See color options under *Col Sys Inf.*
Col Applcat	
	Choose the color for completed measurement information displayed on the monitor. See color options under *Col Sys Inf.*
Col Moving	
	Choose a color for the active movable cursor on the display. See color options under *Col Sys Inf.*
Col Aux	
	Choose a color for all auxiliary signal information displayed on the monitor (ECG, AUX, and PCG). See color options under *Col Sys Inf.*
Col Dop Trac	
	Choose a color for the Doppler Spectrum Trace function. See color options under *Col Sys Inf.*

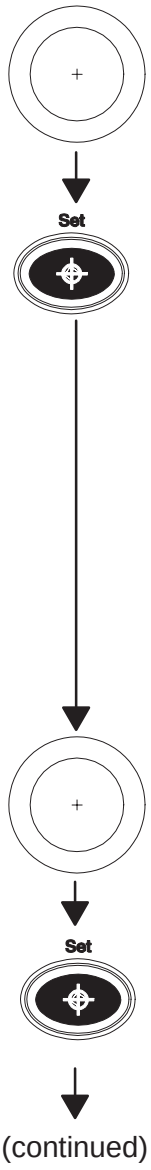
Page 3 of 7 (System Setup)

Use A/N Keys for User Define	
	Choose to use the alphanumeric keys A~Z and 0~9 with the user define function. On or Off.
User Define Key Names & Locks	
	Use this sub-menu to review, name or lock/unlock all available user define keys. The 11 character name of each user defined key is displayed. An asterisk to the left of the name means the key is locked. The user define function cannot be deleted or modified when the key is locked. See *14–100* for details.
CUA/AUA for HADLOCK	
	Choose how gestational age is derived for the Hadlock formulas. CUA Composite Ultrasound Age—gestational age derived by linear regression. AUA Average Ultrasound Age—gestational age derived by averaging.
PSA Calculation	
	Choose how the PSA Caclulation is derived. PSAD Prostate Specific Antigen Density—defined as PSA divided by volume. PPSA Predicted Prostate Specific Antigen—a number which gives the normal level of PSA that would be expected for a prostate of a given volume.
Active Measurement Cursor	
	Choose the Measurement active cursor type. X–mark or Plus–mark.

Page 4 of 7 (System Setup – Body Pattern)

Body Pattern Package 1–8	
	Choose up to 16 body patterns (2 sub-menu pages) for each of the 8 packages. Eight custom body pattern packages are then available for selection to be displayed in the Set Up/Preset Program Menu page one. An illustration of each body pattern available is shown on *6–29*. To select the body pattern package to be used for each user preset within an exam category, refer to *14–65*. See the following pages for details on Customizing or deleting a body pattern package.
Body Pattern Probe Change Erase	
	Choose to erase the displayed body pattern when a probe is changed. On or Off.
Body Pattern Unfreeze Erase	
	Choose to erase the body pattern when the system exits the freeze function. On or Off.
Body Pattern Copy To Active Side	
	Choose to have the selected body pattern copied to the active side during dual format displays. On or Off.

Body pattern package (1–8) customization



Choose the **Set Up** Top Menu, then choose **System Paramtr** (system parameters) from the Set Up Sub-Menu and go to page 4.

Use the **Trackball** to move the arrow cursor to the word “Submenu” of the desired body pattern package number to be customized.

Press **Set**. The body pattern selection Sub-Menu appears.

Figure 14–10. Initial Body Pattern Sub-Menu

The rectangle in the display represents space for two rows of body patterns (2 Sub-Menu display pages). There is a space for 8 body patterns in each row.

Use the **Trackball** to move the arrow cursor to a desired body pattern location.

Press **Set**. A box appears around a Body Pattern or blank space if no pattern is programmed.

(continued)

Body pattern package (1–8) customization (cont'd)

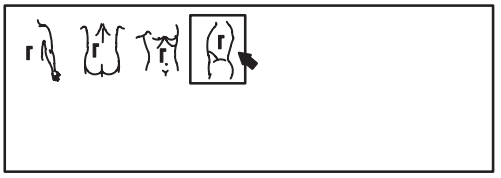
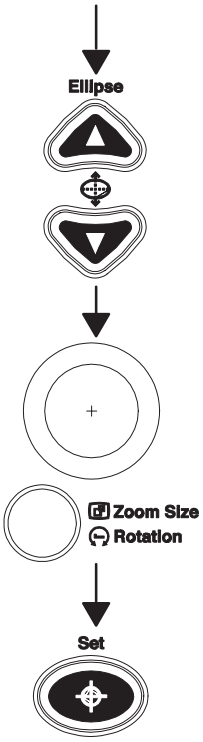


Figure 14–11. Adding Body Patterns



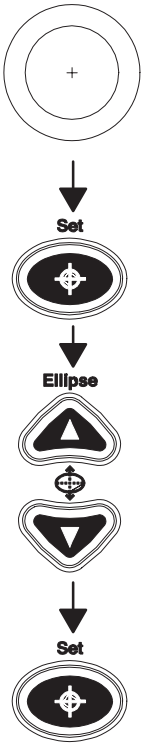
Use the **Ellipse** up/down arrow keys to cycle through the body pattern choices.

When the desired body pattern is displayed, use the **Trackball** and **Zoom Size/Rotation** knob to position the probe orientation marker to the desired default position on the body pattern.

Press **Set** to complete the selection for that menu position.

NOTE: As many as 16 selections (2 rows of 8) can be made for each body pattern package.

Body Pattern Deletion



Use the **Trackball** to position the arrow cursor over the pattern to be deleted.

Press **Set**. A box appears around the Body Pattern.

Use the **Ellipse** up/down arrow keys to cycle to the blank body pattern selection.

Press **Set** to record a blank space for that body pattern location.

Page 5 of 7 (System Setup – Recording)

Report Video Inverse to Printer

Choose to send calculation summary report video to the print device in inverse (reverse) video.

On or Off.

Record 1 B&W or Color

Choose the type of device to be controlled by the Record 1 key for black and white or color images. Use the Ellipse up/down arrow keys to cycle through the selections.

Black and White Polaroid Camera, Color Polaroid Camera, Black and White Printer, Color Printer, Multi Image Camera, MO Archive, HD Storage or Computer.

Record 2 B&W or Color

Choose the type of device to be controlled by the Record 2 key for black and white or color images. Use the Ellipse up/down arrow keys to cycle through the selections.

Black and White Polaroid Camera, Color Polaroid Camera, Black and White Printer, Color Printer, Multi Image Camera, MO Archive, HD Storage or Computer.

Report

Choose the type of device that will be used to print the calculation summary report pages.

Black and White Polaroid Camera, Color Polaroid Camera, Black and White Printer, Color Printer, Multi Image Camera or Image Archive.

External Video Signal

Choose the type of video signal, from an external source, that is being put into the LOGIQ™ 400.

S-Video	Two component video.
RGB	Red, green, blue and sync.
Col-Comp	Composite color signal.

Color Printer Type

Choose the type of color printer (option) that is attached to the LOGIQ™ 400.

UP3030	Sony UP-3030MD.
UP1850	Sony UP-1800/UP-1850/UP-2950/UP-2850.
UP1850P	Sony UP–1850P.

Color Printer Memory

Choose how printer memory will be divided and thus how the color print will be formatted.

Single	One picture per sheet.
Quad–Frm	Four pictures per sheet.
Quad–Frmls	Not available.

	Single	**Quad–FRM**
UP-1800 Series/UP-2800 Series/UP-2900 Series	Available	Not Available
UP-1850 Series/UP-2850 Series/UP-2950 Series	Available	Available

Page 5 of 7 (System Setup – Recording) (cont'd)

Color Printer Signal

Choose the type of video signal being sent to the color printer.

RGB	Red, green, blue and sync.
Video	Composite Video.
S-Video	Two component video.

Plug 1–BW

Choose which device has its record/expose cable connected to plug one.

B&W–Prnt	Black and white video page printer.
B&W–Pola	Black and white Polaroid camera.
Col–Pola	Color Polaroid camera.

Plug 2–CLR

Choose which device has its record/expose cable connected to plug two.

B&W–Prnt	Black and white video page printer.
B&W–Pola	Black and white Polaroid camera.
Col–Pola	Color Polaroid camera.

Port A/B

Choose the type of device that has an interface cable connected to VCR/printer ports A and B.

Off	No connection.
Multi Image Camera	Multi Image Camera.
VCR	Video Cassette Recorder.
Color Printer	Color Printer.
Computer	Data Management Center Computer.
Line Printer–USA Only	Paper Line Printer.

Maskline Record

Choose to display the operator message area during the record function.

On or Off.

B&W Printer Exposure Pulse Length [msec]

Set the exposure pulse length needed to trigger the B&W printer print function.

Length from 50 to 500 ms in 50 ms intervals.

B&W Printer Exposure Min Interval [sec]

Set the minimum interval in seconds between B&W printer exposure capabilities.

Interval from 1 to 10 in 0.5 sec intervals.

Page 5 of 7 (System Setup – Recording) (cont'd)

B&W Image Archive	
	Choose how a Black & White image will be archived. B&W or Color.
Color Image Archive	
	Choose how a Color image will be archived. B&W or Color.

Page 6 of 7 (System Setup – User ID and Password)

Password Ask	
	Choose to use the password security option at power up by asking for the user ID and password. On or Off. *NOTE: Refer to 3–20 for usage of the password function.*
User ID 1–8	
	As many as eight user ID codes can be entered into the system parameters. These can be used for security purposes. When used with an accompanying password, user ID establishes limited access to the system at power up. Maximum of 8 alphanumeric characters for each user ID.
Password 1–8	
	As many as 8 passwords can be entered to correspond with the 8 user ID codes. These must be used when password ask is on. Maximum of 8 alphanumeric characters for each password. *Initially, User ID Codes are blank. A User ID must be entered before a password can be recorded.*

Selecting an ID

- Select the desired User ID number on page 6 of the Set Up/System Parameter Menu, by moving the arrow cursor over the User ID number and pressing **Set**.
- The User ID entry area is highlighted.
- Type in a maximum of 8 characters for the User ID and press **Return**.

  The User ID is now recorded and displayed on the System Parameter Menu.

Entering a Password

Once a User ID is established or changed, a password can be entered.

- Move the arrow cursor to the desired password and press **Set**.
- Type in the new password. Press **Return**.
- Type in the new password a second time for re-confirmation. Press **Return**.

NOTE: The password function is upper and lower case sensitive.

The Password function is not active unless "Password Ask" in the Set Up/System Parameter menu page 6 is set to On.

Changing/Deleting a Password

To change or delete a password:

- Move the arrow cursor to the desired password and press **Set.**
- In the highlighted password area, type the old password. Press **Return**.
- To change a password, type in the new characters. Press **Return**. To delete a password, type in 8 spaces. Press **Return**.
- Type the new password or 8 spaces a second time for confirmation. Press **Return**.

The password is now changed or deleted.

Changing/Deleting a User ID

To change or delete a User ID:

- Move the arrow cursor to the desired User ID and press **Set.**
- Input the old password. Press **Return**.
- Type in the new User ID to change or type in spaces to delete the User ID. Press **Return**.

The User ID is now changed or deleted.

NOTE: If the User ID is deleted (all spaces), the corresponding password is also deleted.

If no password is selected with the User ID, the ID can be changed or deleted directly. There is no requirement to enter the old password.

Page 7 of 7 (DICOM)

Menu Selection at New Patient	
	Choose what screen will be displayed when the New Patient key is pressed.
	Patient_Entry Displays standard patient entry screen for the default exam category. Schedule Displays the DICOM patient schedule screen.
Sort Criteria for Schedule List	
	Choose how to sort the entries on the DICOM patient schedule screen.
	Date&Time Arrange by date and time of patient session. Name Arrange by Patient Name.
Patient Name Format	
	Choose how the Patient Name entry will be displayed for the Patient Entry Menu.
	Full_Name One block for entering patient name. Last &First Separate blocks for entering patient last name and patient first name.
Auto Deletion of Transferred Queue	
	Choose to automatically delete the image from the queue after successful DICOM transfer.
	Yes or No.

Preset Program

Overview

Preset Program in the Set Up top menu is 10 pages of preset parameters that are generally considered application parameters. They are exam category and preset name dependent.

Special features in the Preset Program Sub-Menus are:

- Annotation Library script designation
- Summary report display format editing
- User programmable OB table editing
- Calculation sequence programming
- Mode measurement menu customizing

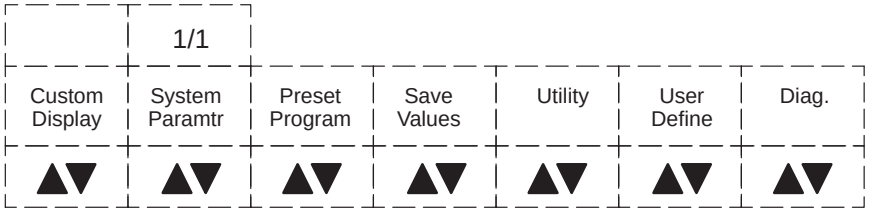


Figure 14–12. Set Up Top Sub-Menus (Preset Program)

A brief description of each preset parameter and the choices available for that preset follows.

*NOTE: If it is necessary to quickly return to the Preset Program Sub-Menu page 1, press **Ctrl** and **1** simultaneously.*

Refer to 14–6 for the key to the codes used to describe each parameter's affect.

Preset Program Contents

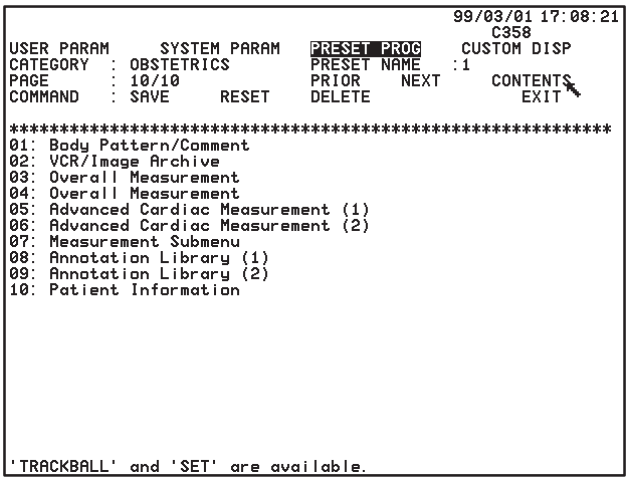


Figure 14–13. Preset Program Contents Page

The Preset Program Contents pages shows a summary of the 10 menu pages.

Trackball the cursor to the desired page and press **Set**.

Page 1 of 10 (Application)

Body Pattern Probe Mark Preset EC, UP

Choose to activate the preset position of the probe marker graphic.

On or Off.

Body Pattern Package EC, UP

Choose one of the 8 customized body pattern packages to be displayed with the current application preset.

Body pattern package 1, 2, 3, 4, 5, 6, 7 or 8.

Refer to *14–54* for details on programming the contents of each body pattern package.

Comment Erase at Display Change EC

Choose to erase all comments when a change is made in scan mode.

On or Off.

Comment Home Position Horizontal EC, R

Choose a point on the horizontal axis for the comment cursor home position.

Enter 1 to 56 in 1 digit increments.

Comment Home Position Vertical EC, R

Choose a point on the vertical axis for the comment cursor home position.

Enter 1 to 26 in 1 digit increments.

Comment Clear Key Function EC

Choose to erase all comments with the Clear key or just the line of comments that the cursor is on.

All	Erase all comments on the screen.
Line	Erase the comments on the cursor line. The second time Clear is pressed, all comments will be erased.

Trackball Function at Freeze EC

Choose the function assigned to the Trackball when the image is frozen.

No	No function assigned.
Measure	Trackball assigned to the measurement function.
Comment	Trackball assigned to the comment function.
Body	Trackball assigned to the body pattern function.

CRT Menu Auto Display at Measurement EC

Choose to display the Measurement Sub-Menu automatically when the Measurement key is pressed.

On or Off.

Page 1 of 10 (Application) (cont'd)

CRT Menu Auto Display at Comment EC	
	Choose to display the Comment Sub-Menu automatically when the Comment key is pressed. On or Off.
CRT Menu Auto Display at Body Pattern EC	
	Choose to display the Body Pattern Sub-Menu automatically when the Body Pattern key is pressed. On or Off.
CRT Menu Auto Display at Image Recall EC	
	Choose to display the Image Recall Sub-Menu automatically when the Image Recall key is pressed. On or Off.

Page 2 of 10 (Application)

VCR Rec Audio Doppler EC	
	Choose the format for audio recording in Doppler mode on the VCR. Stereo — Right/left channel separation. Dop–L/Voice–R — Doppler on left channel and voice on the right channel.
VCR Play Audio EC	
	Choose how to playback VCR recorded audio. Stereo — Left and right separation. Mono–L — Left speaker only. Mono–R — Right speaker only.
VCR Play Audio Volume [%] EC, R	
	Choose the default percentage of volume level for VCR playback audio. Percentage from 0 to 100 in 4 digit increments.
VCR Color Intensity EC	
	Choose the desired Color Intensity processing for VCR playback. 1 Optimized Chrominance Gain. 2 Normal Processing.
Image Archive Compression EC	
	Choose to compress the image archive data for the DEFF format. Yes or No. *NOTE: If image compression is used, images saved by the LOGIQ™ 400 cannot be read on other TIFF Readers, DEFF devices or the LOGIQ ™ 700. However, they can be read on the LOGIQ ™ 500.*

Page 3 of 10 (Application – Measurement)

Time Unit EC	
	Choose the unit of display for all time measurements.
ms	milliseconds.
sec	seconds.
Length Unit EC	
	Choose the unit of display for all length (distance) measurements.
mm	millimeters.
cm	centimeters.
Velocity Unit EC, UP	
	Choose the unit of display for all velocity measurements.
cm/s	centimeters per second.
m/s	meters/second.
auto	displays in either cm/s or m/s depending on velocity measured.
Circ/Area Method EC	
	Choose the method to be used for circumference/area measurements.
Trace	Manually trace with the Trackball.
Ellipse	Ellipse method.
Circle	Circle method.
2 Dist	Two diameter (distance) method.
Diameter	Single distance method.
Echo Level Method EC	
	Choose the size of the echo level measurement box cursor.
Box 3mm	3mm x 3mm box.
Box 5mm	5mm x 5mm box.
Box 7mm	7mm x 7mm box.
Heart Rate Method EC	
	Choose the method for measuring heart rate.
Auto	Automatic Calibration.
Manual	Manual Calibration.
VCRPB Calib Method EC	
	Choose the default method for VCR playback calibration.
Auto	Automatic Calibration.
Manual	Manual Calibration.
Average Activity EC	
	Choose to enable the calculation summary report page measurement averaging function.
	On or Off.

Page 3 of 10 (Application – Measurement) (cont'd)

Max Velocity (Advanced Vascular) EC

This selection is used with the Advanced Vascular option only. When turned on it overrides the Average Activity preset to cause the Advanced Vascular report page to display maximum velocity rather than latest or average.

On or Off.

Average Number EC

Choose how many measurements will be used in the averaging function. The Cardiology exam category with AMCAL has a choice of 5 measurements whereas the other exam categories have a choice of 3 measurements.

1, 2, 3, 4 or 5.

Mask Image EC, UP

Choose to put the measurement/calculation results in a colored box over the image or just the graphic characters over the image.

Off	Graphics are placed on top of the image.
On	Graphics are placed in a colored box on top of the image.

Trace Auto EC

Choose to enable the automatic measurement of TAMAX, TAMIN, TAMEAN or TAMODE. See "D Realtime Trace Method" in Set Up/Custom Display page 13 for trace method selection on *14–35*.

On or Off.

Add 1 Week to EDD EC

Choose to add an additional week to the displayed estimated date of delivery.

On or Off.

Display EDD with GA Value EC

Choose to display the estimated EDD with GA.

On or Off.

Diastole/Systole Determination EC

Used with Advanced Cardiac Calculation option. Determine if measurement is systole or diastole automatically from the measurements relationship to the ECG wave.

Manual	Automatic determination disabled.
Auto	Automatic determination enabled.

Page 3 of 10 (Application – Measurement) (cont'd)

R Delay Time of End Systole Prior Edge EC, UP	
	Used with automatic determination of systole/diastole in the Advanced Cardiac Calculation option. Sets the delay time on the ECG wave to ensure systole will be properly determined. Use the Ellipse up/down arrow keys to enter a number between 0 and 2000 msecs.
End Systole Period from Prior Edge EC, UP	
	Used with Automatic determination of Systole/Diastole in the Advanced Cardiac Calculation option. Sets the delay time on the ECG wave to ensure diastole will be properly determined. Use the Ellipse up/down arrow keys to enter a number between 0 and 2000 msecs.
Media Selection for Fetal Trend EC	
	Used with the Fetal Growth Trend option. Sets the media to be used to store patient data. The hard drive has a much limited capacity. HD System Hard Drive. MO Magnetic Optical Disk (removeable).
Measurement Clear Operation EC	
	When Clear is pressed, decide if it will erase measurements only or measurements and comments. Meas.–only Erase only measurements not comments. with–Comment Erase measurements and comments simultaneously.

Page 4 of 10 (Application – Measurement)

Diastole Velocity for PI EC, UP	
	Choose which velocity value will be used to calculate end diastole. Vmin Minimum value of the whole trace. Vd Minimum value detected before Vmax (end diastole). Minimum value part of a heart rate period. If Vd is not detected, use Vmin.
Diastole Velocity for RI EC, UP	
	Choose which velocity value will be used to calculate end diastole. Vmin Minimum value of the whole trace. Vd Minimum value detected before Vmax (end diastole). Minimum value part of a heart rate period. If Vd is not detected, use Vmin.
Diastole Velocity for S/D (D/S) EC, UP	
	Choose which velocity value will be used to calculate end diastole. Vmin Minimum value of the whole trace. Vd Minimum value detected before Vmax (end diastole). Minimum value part of a heart rate period. If Vd is not detected, use Vmin.
Averaging Number for Doppler Realtime Calc EC, UP	
	Choose how many heart rate periods will be averaged prior to being displayed in the realtime calculation window. 1, 2, 3, 4 or 5.
RI Calculation to bidirectional Flow EC, UP	
	When the flow direction for systolic velocity and diastolic velocity are different, set this parameter to on for the RI calculation. Off Bidirectional flow not considered in RI calculation. On Bidirectional flow considered in RI calculation.
Hip Orientation EC, UP	
	Choose the type of Hip Orientation method to be used for scanning the infant hip. Cranial–left Cranial structures are on the left; caudal structures are on the right. Caudal–left Caudal structures are on the left; cranial structures are on the right.
Stepper Increment [mm] EC, UP	
	Choose the stepper increment for area measurements in millimeters. 5 or 2.5.
PPSA Coefficient (1) EC, UP	
	Set the desired default PPSA Coefficient for the first PPSA calculation on the Urology Report page. Coefficient from 0.01 to 0.99.

Page 4 of 10 (Application – Measurement) (cont'd)

PPSA Coefficient (2) EC, UP

Set the desired default PPSA Coefficient for the second PPSA calculation on the Urology Report page.

Coefficient from 0.01 to 0.99.

Display MaxPG with Velocity EC, UP

Choose the default for displaying MaxPG with peak velocity.

Off or On.

Arrow Mark Display EC, UP

Choose the default for displaying the arrow mark when the Measurement key is pressed a certain number of times. See Table 7–1 on *7–5* for more details.

Off or On.

% Stenosis Calculation EC, UP

In Advanced Vascular, choose the default measurement type for calculating % Stenosis.

Area or Distance.

CAUTION: If this preset is changed, the previous % Stenosis measurement results will be erased.

B Auto Caliper Control EC, UP

Choose the location of the caliper for subsequent measurements while in B-Mode.

Off	The caliper is not displayed after a measurement is performed.
On	The caliper is in the home position.
1'st	The caliper is positioned at the previous measurement's first cursor position.
2'nd	The caliper is positioned at the previous measurement's second cursor position.

M Auto Caliper Control EC, UP

Choose the location of the caliper for subsequent measurements while in M-Mode.

Off	The caliper is not displayed after a measurement is performed.
On	The caliper is in the home position.
1'st	The caliper is positioned at the previous measurement's first cursor position.
2'nd	The caliper is positioned at the previous measurement's second cursor position.

D Auto Caliper Control EC, UP

Choose the location of the caliper for subsequent measurements while in Doppler Mode.

Off	The caliper is not displayed after a measurement is performed.
On	The caliper is in the home position.
1'st	The caliper is positioned at the previous measurement's first cursor position.
2'nd	The caliper is positioned at the previous measurement's second cursor position.

Page 5 & 6 of 10 (Application – Measurement Sub-Menu)

Cardiac Measurement Choices	EC, UP
	Used with Advanced Cardiac Calculation option. Determine if the measurement will be used in the automatic M-Mode calculation sequence.
	Off Automatic measurement callout will NOT be made. On Automatic measurement callout WILL be made.

Page 7 of 10 (Application – Measurement Submenu)

Report Format	EC
	If the current exam category has an associated summary report page, select this menu option to change the vertical (y) position of the measurement elements on the report page. The elements that can be edited depend on each report page.

Advanced Report Formatting

The LOGIQ™ 400 allows for user control of each exam category summary report measurement display format.

Except for the protected 5 lines of each report page (that has hospital and patient information) and the bottom area for calculations and comments, the vertical position (“y”) of the measurements can be customized by the user.

Factory default items can be deleted or user desired items added.

Example report format change

Exam Category: OB

OB measurements are limited to changes in the vertical position (“y”) on the report page.

To change the position of a measurement:

From the Set Up/Preset Program Menu page 7, use the **Trackball** to place the arrow cursor over Report Format and press **Set**. The report format editor screen appears.

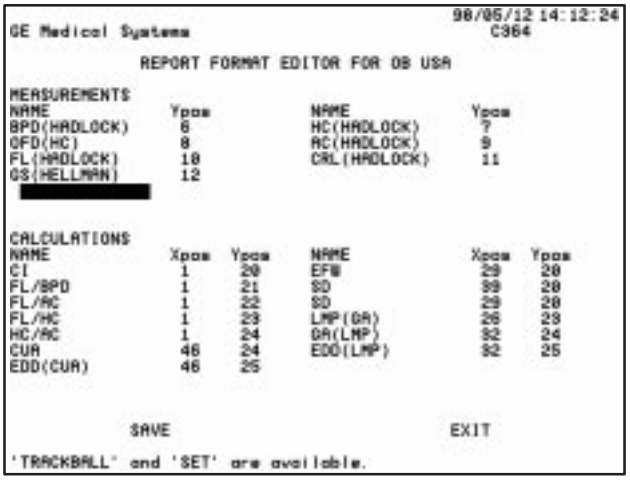


Figure 14–14. Report Format Editor

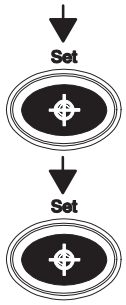
Use the **Trackball** or **Return** to position the highlighted area over the “Ypos” of the measurement to be changed.

Type the new position number.

Use the **Trackball** to highlight any additional positions to be changed.

(continued)

Example report format change (cont'd)

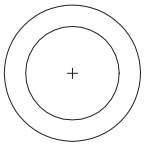


When all changes are complete, highlight Save and press **Set**.

To exit the Report Format Editor and return to the Set Up/ Preset Program Menu, highlight Exit and press **Set**.

To Add or Delete a measurement:

Enter the Report Format Editor in the same manner as "To change the position".

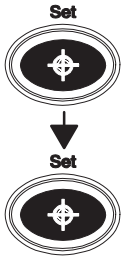


Use the **Trackball** to highlight the desired measurement name (to delete or change) or highlight a blank area (to add).

To delete a name, type in all spaces.
To change a name, type over the current name.
To add a name, type in the new name.

NOTE: When adding or changing a measurement name, it must contain 2 important elements:

- *Measurement type. For example, GS, BPD, CRL, HC.*
- *Author's name. The author's name must appear in parentheses, for example (Hadlock), (Hellman).*



Highlight Save and press **Set** to record all changes.

Highlight Exit and press **Set** to return to the Set Up/Preset Program menu.

NOTE: If 2 measurement names are placed in the same position, an error message appears.

"More than 1 Measurement Field Name at the SAME Ypos".

Page 7 of 10 (Application – Measurement Submenu) (cont'd)

User Table Editor

If the factory preset OB tables are not suitable, the user can input data for five OB tables. The titles given to these tables appear as selections in the OB Calculations Soft-Menu when displayed.

To program a user table

Select the **Set Up** Top Menu.

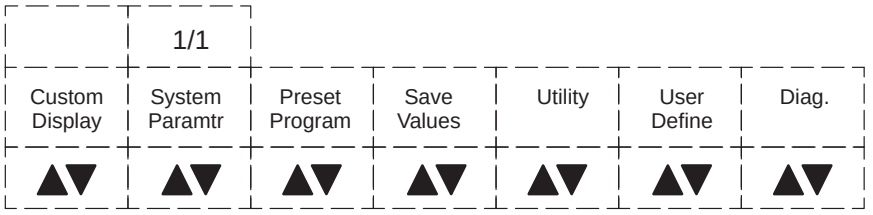
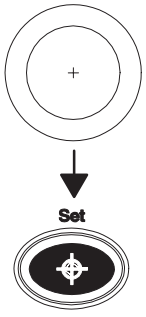


Figure 14–15. Set Up Top Menu

Select **Preset Program** from the Set Up Sub-Menu. The preset program selections are displayed over the image on the monitor.



Use the **Trackball** to place the arrow cursor over User Table Editor.

Press **Set** to display the User Table Programming Main Menu.

The User Table Programming main menu appears as shown in Figure 14–16.

To program a user table (cont'd)

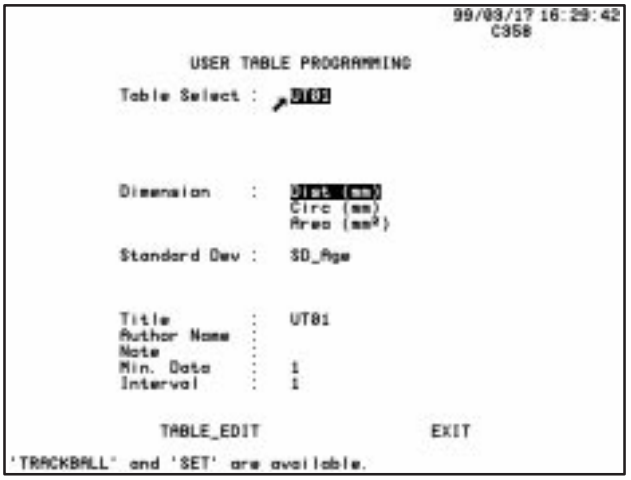
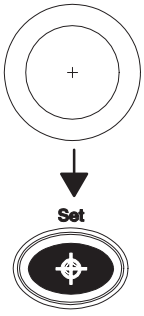


Figure 14–16. User Table Programming



Use the **Ellipse** up/down arrow keys to select the desired table number UT01 to UT10.

Press **Set** to select the desired table.

Use the **Trackball** to place the arrow cursor on the desired table dimension. The choices are Dist (mm) for distance in millimeters, Circ (mm) for circumference in millimeters and Area for area in square millimeters. Press **Set** when the cursor is over the correct dimension.

Use the **Trackball** to move the arrow cursor to the title block. Type in the desired table title (maximum 4 characters). Press **Return**.

Type in the author's name (maximum 8 characters). Press **Return**.

To program a user table (cont'd)

Type in any desired notes (maximum 30 characters). Press **Return**.

Type in the minimum or beginning data value for the table (maximum 4 digits). Press **Return**.

Type in the interval value between each table data point (maximum 4 digits). Press **Return**.

The selection "Table-Edit" should now be highlighted. Press **Set**.

*NOTE: The **Return** key or **Trackball** can be used to cycle through the menu selections. To make a choice, press **Set**.*

User Table on EFW

The measurement made by the User Table can be used for the calculation of EFW. Move the cursor to the right of "Title of" in the User Table Programming Menu. The available measurement name for calculation of the EFW is displayed after the Ellipse up/down arrow key is pressed.

The OB Report Format preset, located on SetUp/System Parameters page 2, determines which measurements are displayed.

To enter table values

The Table-Edit Menu shown in Figure 14–17 allows for adding data, editing data or clearing (deleting) a User Table.

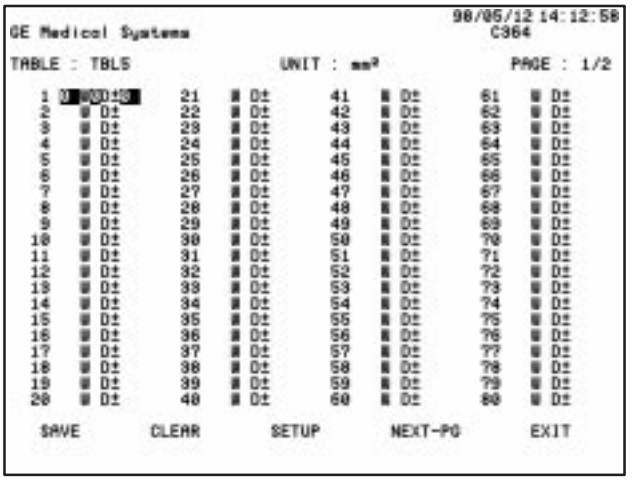


Figure 14–17. Table Edit Menu

For each data point, the weeks (2 digits), days (1 digit) and deviation (2 digits) must be entered.

The menu choices at the bottom allow:

SAVE	Saves the table in its current form.
CLEAR	Clears or deletes the entire table (and title).
SETUP	Returns to the User Table Programming Setup menu.
NEXT-PG	Goes to the next page to continue data entry.
EXIT	Exits the User Programmable Table function.

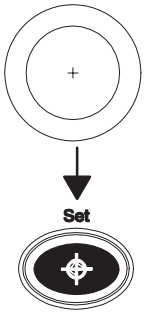
Trackball to one of the above choices and press **Set**. When exit is selected without doing a “Save”, all additions or edits are lost. The table reverts to its previous state.

NOTE: If a new table was added, the measurement can be added to the summary report. Follow the instructions under Report Format in the Set Up/Preset program.

Page 7 of 10 (Application – Measurement Submenu) (cont'd)

Sequence 1–8	**EC, UP** (Auto Sequence Programming)
	The user can program a maximum of 8 calculation sequences with a maximum of eight measurements per sequence. These are labeled Sequence 1–8 in the Set Up/Preset Program Menu as USERSEQUENCE1–8 in the Measurement Sub-Menu or in the Auto Sequence Top Menu. When Sequence 1–8 is chosen from the Auto Sequences Top Menu or the Measurement Sub-Menu, the system automatically prompts the user through the calculations previously programmed.

Program a User Sequence



Use the **Trackball** to move the arrow cursor to the desired sequence number (1–8) on page 7 of the Set Up/Preset Program Menus.

Press **Set**. The first page of the 8 Measurement Sequence Sub-Menus is displayed.

```
                                                    07/30/97 08:40:04
                                                          $317
USER PARAM      SYSTEM PARAM    PRESET PROG     CUSTOM DISP
CATEGORY   : OBSTETRICS         PRESET NAME   :General   OB
PAGE       : 7/10               PRIOR    NEXT     CONTENTS
COMMAND    : SAVE     RESET     DELETE             EXIT

********* Measurement Sequence Submenu **********************
USERSEQUENCE1   1               UNDEFINED       NEXT CALC
UNDEFINED       OB CTAR         OB EF           OB PLI
OB Vmax         OB S/D          OB D/S          OB RI
OB PI           AFI             USA   OB USER1 USA   OB USER2
USA   OB USER3 USA   OB USER4   USA   OB USER5 EUROP OB USER1
EUROP OB USER2 EUROP OB USER3   EUROP OB USER4 EUROP OB USER5
TOKYO OB USER1 TOKYO OB USER2   TOKYO OB USER3 TOKYO OB USER4
TOKYO OB USER5 OSAKA OB USER1   OSAKA OB USER2 OSAKA OB USER3
OSAKA OB USER4 OSAKA OB USER5   GS HELLMAN      GS HANSMANN
GS TOKYO        GS REMPEN       CRL HADLOCK     CRL JEANTY
CRL CAMPBEL     CRL HANSMANN    CRL ROBINSN     CRL PARIS
CRL NELSON      CRL TOKYO       CRL TOKYO-S     CRL OSAKA
CRL REMPEN      CRL ASUM        BPD HADLOCK     BPD JEANTY
BPD CAMPBEL     BPD HANSMANN    BPD PARIS       BPD SOSTOA
BPD KURTZ       BPD TOKYO       BPD TOKYO-S     BPD OSAKA
BPD REMPEN      BPD ASUM        FL HADLOCK      FL JEANTY
FL CAMPBEL      FL HANSMANN     FL PARIS        FL SOSTOA
FL TOKYO        FL  TOKYO-S     FL OSAKA        AC HADLOCK
AC JEANTY       AC HANSMANN     AC SOSTOA       AC  TOKYO-S
AC ASUM         HC HADLOCK      HC JEANTY       HC HANSMANN
'TRACKBALL' and 'SET' are available.
```

Figure 14–18. Measurement Sequence Sub-Menu

NOTE: The first row under the sub-menu title line shows 3 important items:

Program a User Sequence (cont'd)

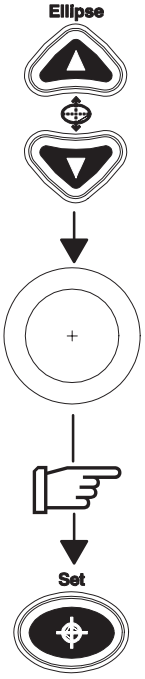
********** Measurement Sequence Submenu **********			
USERSEQUENCE2	8	UNDEFINED	NEXT CALC

Figure 14–19. Sequence Sub-Menu Status Line

8 is the order in which the measurement or calculation will be made in USERSEQUENCE 2. 1 is first, 2 is second.....8 is last.

UNDEFINED is the current measurement in that sequence location. Undefined means it is blank.

NEXTCALC allows the user to cycle through the 8 pages of measurements and calculations available to be programmed.



Use the **Ellipse** up/down arrow keys to cycle to the desired usersequence measurement number (1–8).

Use the **Trackball** to move the arrow cursor to the desired measurement/calculation.

Move the arrow cursor to Next Calc and press **Set** if a sub-menu page change is necessary.

Press **Set** when the arrow cursor is over the desired measurement/calculation.

The newly selected measurement/calculation appears as the current measurement for the highlighted USERSEQUENCE number replacing undefined.

Repeat the previous steps as necessary to program additional sequence number locations for any of the 8 user sequences.

Program a User Sequence (cont'd)

Hints

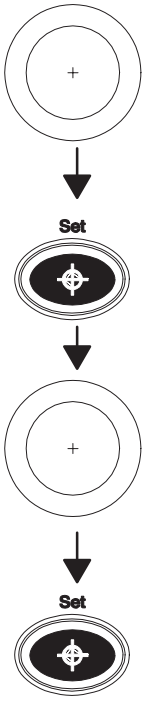
USERSEQUENCE1–8 are choices that can be programmed in the Measurement Menus for each mode (B, M, D, and CFM) per exam category.

Auto Sequence Top Menu choices are exam category dependent. Sequences programmed in Vascular are not available when the Cardiac exam category is selected.

UNDEFINED means no measurement/calculation is in that location.

Use UNDEFINED to delete a desired measurement.

To customize the Usersequence/Auto Sequence name:



Move the **Trackball** to the USERSEQUENCE# at the top of one of the 8 Calculation menus.

Press **Set**.

Type in the name of the Usersequence. The space available is 2 lines of 7 characters each.

Move the **Trackball** to SAVE.

Press **Set**.

Performing an Auto Sequence (USERSEQUENCE)

Select an Auto Sequence, or a user programmable mode measurement menu selection, the system automatically prompts the user to do the first measurement in the sequence.

After the first measurement/calculation is completed, the system automatically prompts the user to do the second measurement in the sequence.

This continues until all measurements are completed.

Sequence Modification

During the Auto Sequence function:

Press the top of the **Elllipse** up/down arrow keys to skip a desired measurement and advance to the next measurement in the sequence.

Press the bottom of the **Ellipse** up/down arrow keys to skip back to a previous measurement in the sequence.

Measurements skipped will appear again at the end of the sequence. This gives the user a second chance to make the measurements prior to exiting the Auto Sequece function.

Page 7 of 10 (Application – Measurement Submenu) (cont'd)

Measurement Menu B/M/D/CFM EC, UP	
	Each exam category has a set of factory default measurements/calculations. The 4 measurement menu modes allow the user to add a maximum of 4 new pages to the measurement sub-menus per exam category per mode within a user application preset. With 8 items per page, a total of 32 measurements/calculations can be added for each exam category in B, M, D, which is distinct and separate from those that can be programmed into CFM-Mode. *NOTE: Measurements and Calculations setup for Measurement Menu B are not transferred to Menu M, D, or CFM. Each one is separate.*

Organization

There are 4 pages of space available for the user to add measurements and calculations to an exam category measurement menu.

These pages do not appear in the Soft Menu display unless items are placed in the number location of that page.

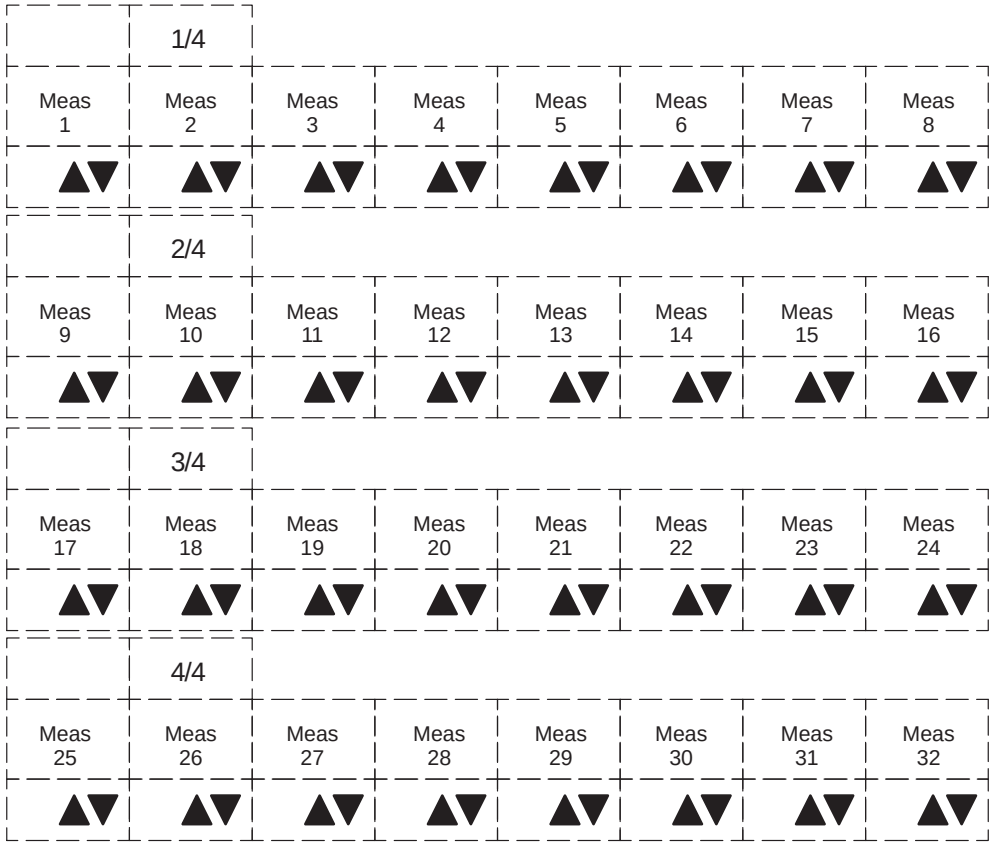
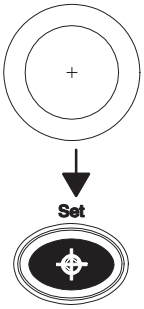


Figure 14–20. Measurement Menu Key Numbers

The spaces available for calculations are called Key Numbers. Key Numbers 1 through 8 are on page 1, 9 through 16 on page 2 etc. (See Figure 14–20).

Programming Measurements



Use the **Trackball** to move the arrow cursor to the desired Measurement Menu (B, M, D, or CFM) on page 7 of the Set Up/Preset Program menus.

Press **Set**. The last page viewed of the 4 measurement pages is displayed.

```
                                                    99/04/22 15:11:18
                                                          C551
USER PARAM      SYSTEM PARAM    PRESET PROG     CUSTOM DISP
CATEGORY   : OBSTETRICS         PRESET NAME   :General    OB
PAGE       :  7/10              PRIOR    NEXT     CONTENTS
COMMAND    : SAVE     RESET     DELETE              EXIT

********* Measurement CRT Softmenu Setup Submenu ***********
KEY NUMBER          1           UNDEFINED       NEXT CALC
UNDEFINED       USERSEQUENCE1   USERSEQUENCE2   USERSEQUENCE3
USERSEQUENCE4   USERSEQUENCE5   USERSEQUENCE6   USERSEQUENCE7
USERSEQUENCE8   TRACE AUTO      ANATOMY SURVEY  OB GRAPH
OB REPORT       GYN REPORT      VASC REPORT     LV REPORT
CARD REPORT     Venous Report   Caratid Report  UROLOGY REPORT
OB CTAR         OB EF           OB PLI          OB Vmax
OB S/D          OB D/S          OB RI           OB PI
AFI             USA  OB USER1   USA  OB USER2   USA  OB USER3
USA  OB USER4   USA  OB USER5   USA  OB USER6   USA  OB USER7
USA  OB USER8   USA  OB USER9   USA  OB USER10  EUR  OB USER1
EUR  OB USER2   EUR  OB USER3   EUR  OB USER4   EUR  OB USER5
EUR  OB USER6   EUR  OB USER7   EUR  OB USER8   EUR  OB USER9
EUR  OB USER10  TYO  OB USER1   TYO  OB USER2   TYO  OB USER3
TYO  OB USER4   TYO  OB USER5   TYO  OB USER6   TYO  OB USER7
TYO  OB USER8   TYO  OB USER9   TYO  OB USER10  OSK  OB USER1
OSK  OB USER2   OSK  OB USER3   OSK  OB USER4   OSK  OB USER5
OSK  OB USER6   OSK  OB USER7   OSK  OB USER8   OSK  OB USER9
OSK  OB USER10  GS HELLMAN      GS HANSMANN     GS TOKYO
GS REMPEN       CRL HADLOCK     CRL JEANTY      CRL CAMPBEL
'TRACKBALL' and 'SET' are available.
```

Figure 14–21. Measurement Setup Sub-Menu

NOTE: The first row under the sub-menu title line shows 3 important items.

Programming Measurements (cont'd)

Figure 14–22. Sequence Sub-Menu Status Line

1 is the position in the soft menu where the measurement for key number one will be displayed.

USERSEQUENCE1, or the customized name, is the current measurement sequence in that key number location.

NEXTCALC allows the user to cycle through the four pages of measurements and calculations available.

Remembering how the key numbers are organized (see Figure 14–20), use the **Ellipse** up/down arrow keys to change to the desired key number.

Move the arrow cursor to NEXTCALC and press **Set** if a sub-menu page change is necessary.

Press **Set** when the arrow cursor is over the desired measurement/calculation.

The newly selected measurement/calculation appears in the highlighted key number location.

NOTE: If key number is desired to be empty (blank, deleted) choose UNDEFINED.

Factory default measurements/calculations are protected and cannot be changed.

Adding authors to a measurement menu does NOT automatically add the measurement to the report page.

Repeat the previous steps to program any key number in any mode menu. Be sure to use the Save function prior to exiting the Calculation menus and the Preset Program menus.

Page 7 of 10 (Application – Measurement Submenu) (cont'd)

Cardiac Calculation EC, UP	
	This sub menu can be used to rearrange the order of the automatic cardiac measurement prompts for the Advanced Cardiac Calculation option. Refer to the *Advanced Reference Manual* for details on measurement sequence modification.
D Realtime Calc. EC, UP	
	This sub menu is used to select and arrange the parameters that are displayed in the D Realtime Calc. window in the upper left of the monitor.

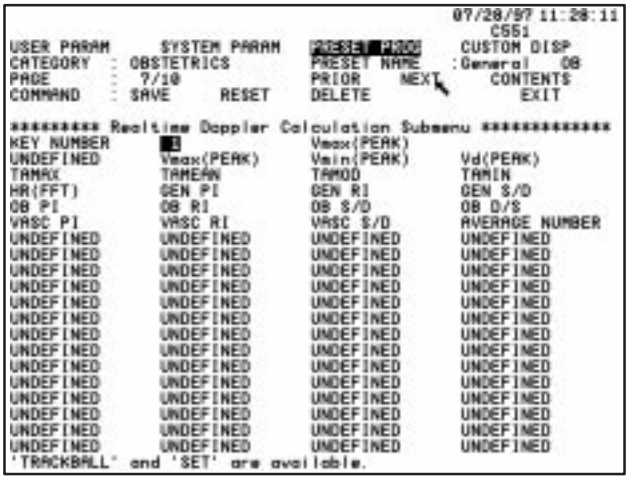


Figure 14–23. Realtime Doppler Calculation Sub-Menu

A maximum of 8 lines (parameters) can be displayed.

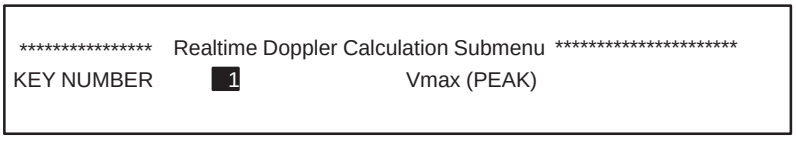


Figure 14–24. Realtime Doppler Calculation Sub-Menu Status Line

Page 7 of 10 (Application – Measurement Submenu) (cont'd)

1 is the position number or line of the Doppler Realtime display.

Use the **Ellipse** up/down arrow keys to change to the desired line number (1–8).

Move the arrow cursor to the desired measurement/calculation to be displayed on that line.

Press **Set** when the arrow cursor is over the desired measurement/calculation.

The newly selected measurement/calculation appears to the right of the position number.

NOTE: Remember that this setup is Exam Category and User Preset dependent. If changes are desired to the factory defaults, a new User Preset will be created.

Page 8 & 9 of 10 (Application – Annotation Library)

Annotation Library 1–24 EC, UP

Type in the desired (most commonly used) display annotations. There is space for a maximum of 20 characters (numbers, letters and spaces) for each library script. A maximum of 24 annotation library scripts is available per exam cagegory.

Simply place the arrow cursor across from the desired annotation library number and press **Set**.

Type the desired script.

Press **Set** to complete the entry.

Page 10 of 10 (Application – Patient Information)

New Patient Y/N Ask EC

In the new patient entry menu, choose to ask to erase all current patient data.

On or Off.

Display Unit Age 1–4 EC

Choose the priority for the units to be used to display patient age. Age 1 is the highest priority. Age 4 is the lowest priority.

year	Display age in years.
month	Display age in months.
week	Display age in weeks.
day	Display age in days.
nodisp	No display.

Display Unit Height 1–3 EC

Choose the priority to be used for the units to display the patient's height.

cm	Centimeters
inch	Inches
feet-inch	Feet and inches
nodisp	No display

Display Unit Weight 1–2 EC

Choose the priority to be used for the units to display the patient's weight.

kg	Kilograms
lbs	Pounds
none	None

Save Values

Overview

Save Values is a selection in the Set Up Menu that allows for the quick retention of a current system settings and preset parameters.

It works like the Save command in the Custom Display, System Parameter or Preset Program sub-menus.

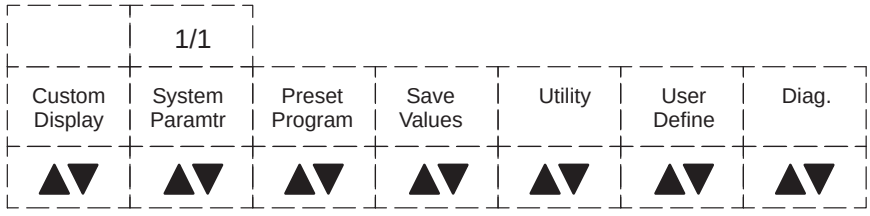


Figure 14–25. Set Up Sub-Menu

Saving Scan Values

If at any time during a scan it is felt that the system settings are optimized and should be saved as an Exam Applications Preset, simply select **Save Values**.

The system will start the process of saving all of the current settings as a User Exam Applications Preset.

If a factory default applications preset is active when Save Values is selected, the message:

"Input User Preset Number (1-8)"

appears at the bottom of the screen. Enter the preset position number 1 through 8. The data is saved and available for recall at the designated preset location.

Saving Scan Values (cont'd)

If a User Preset is active when Save Values is selected, the message:

"Overwrite existing data 'Y' or 'N'"

appears at the bottom of the screen.

Choose 'Y' to overwrite data in the current preset location or 'N' to designate a new preset location 1 through 8.

Exam Applications Presets

Overview

The top menu Preset selection will display a maximum of eight factory application preset choices for each exam category.

The user may define a maximum of eight application presets for display on the Preset sub-menu designated as page one.

Preset parameters that are exam category dependent and available for customization are found in the Preset Program and Custom Display menus. Some parameters are also probe dependent within the application preset.

Items found under System Parameters affect each exam category, application preset or probe.

Defining a User Preset

User presets appear on page one of the Preset Sub-Menu. They will appear on the Soft Menu Display, as shown in Figure 14–26.

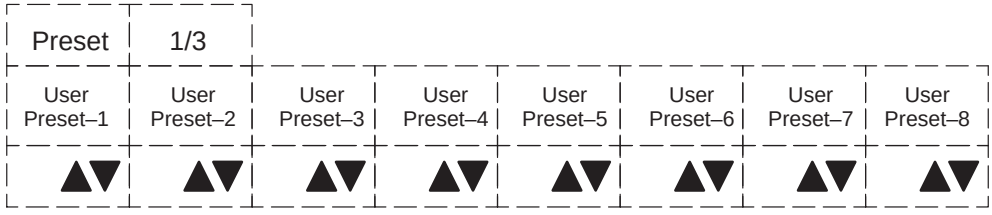


Figure 14–26. User Preset Configuration

Defining a User Preset (cont'd)

To define a User Preset (1–8), first ensure that:

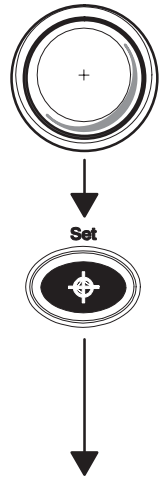
- the system is set to the proper exam category by using **New Patient** or **ID/Name** keys
- the desired probe is connected and activated.
- all keyboard controls (mode, depth, gain, etc.) are set to the desired values.

Mode Default	Preset	Set Up	ECG	Archive	DICOM	Auto Seq	CINE

Figure 14–27. Set Up Top Menu Selection

Select the **Set Up** Top Menu. Select Custom Display or Preset Program.

Make all desired changes to the parameters in the Custom Display and Preset Parameter Sub Menus.



Use the **Trackball** to move the arrow cursor to Save.

Press **Set**. The message "Input User Preset Number (1–8)" appears at the bottom of the monitor.

Enter the desired preset number.

The Preset Name at the top of the menu now displays the number entered (1–8).

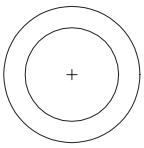
(continued)

Defining a User Preset (cont'd)

NOTE: If a user application preset was used at the start of the process, the system prompt states:

"Overwrite Existing Data? 'y' or 'n'"

Enter 'y' to write over the existing user preset.
Enter 'n' to get the message: "Input User Preset Number (1-8)" and create a new user preset.

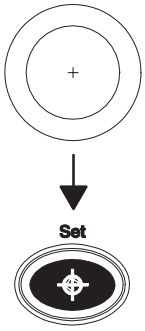


Use the **Trackball** to move the arrow cursor over the Preset Name area.

Press **Set**.

NOTE: If new data is not saved, all changes will be lost when another preset or New Patient is selected.

Naming a User Preset



To give the user preset a name instead of a number:

While in a Custom Display or Preset Program menu page, use the **Trackball** to move the arrow cursor over the Preset Name area. Press **Set**.

Type in the desired name for the User Preset in the designated exam category.

Use the **Trackball** to move the arrow cursor to SAVE and press **Set**.

Answer Yes to the question " Overwrite existing data? 'Y' or 'N' " to save the new User Preset name.

IMPORTANT NOTE: *To ensure that all parameters and the user preset name are saved by the LOGIQ™ 400 before exiting the Set Up function:*

- *select System Parameters, any menu pages 1/7 through 7/7.*
- ***Trackball*** *to the SAVE function in the System Parameters menu and press* ***Set****.*
- *IMPORTANT: Answer 'Y' to overwrite existing data again.*

These steps are important to ensure that the new user preset name is saved.

Deleting User Presets and Names

Display any Set Up/Custom Display or Preset Program sub menu page.

- Use the **Trackball** to move the arrow cursor to the preset name and press **Set**.
- Type in the User Preset position number (1–8) and use the **Space Bar** to delete the rest of the name.
- Use the **Trackball** to move the arrow cursor to Delete menu selection and press **Set**.
- Answer Yes to the question. " Delete data? 'Y' or 'N' ".
- Select System Parameters, any menu page 1–7.
- **Trackball** to the SAVE function in the System Parameters menu and press **Set**.
- Answer Yes to the question "Overwrite existing data? 'Y' or 'N'" to save the new User Preset name.

The last three steps are important to ensure that the User Preset name is cleared.

Recall Preset

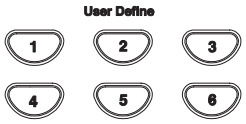
Recall Preset is a selection found on page 3 of the Preset Sub-Menu. Recall Preset can be used during an examination to return the majority of the parameters to the latest saved preset values.

If front panel and soft menu values were changed while scanning, Recall Preset quickly resets these values.

Recall Preset does not recover preset data that was changed with the Save function or was deleted.

User Define Function

Overview



Six keys in the middle of the right side of the console keyboard as well as alphanumeric (A/N) keys A∼Z 1∼0 may be programmed to duplicate a single keystroke or a sequence of 64 keystrokes maximum.

A keystroke is considered to be a press of a key, one movement of a knob or movement of the Trackball.

Programming the User Define Function

- Access the User Define function by pressing the **Set Up** Top Menu Select key.
- Select User Define from the Set Up Sub-Menu.
- Perform the keystroke or sequence of keystrokes to be programmed.
- When complete, press the desired User Define key number or A/N key to record the programming.
- The system will ask: “Save data? ‘Y’ or ‘N’.” Press ‘Y’ on the keyboard to save the user define sequence. Press ‘N’ to cancel the user define programming function.
- If a sequence is already assigned to the selected key, the message will be displayed:

  “Overwrite Existing data? ‘y’ or ‘n’”

User Define keys that have been programmed will be half lighted (back lit).

Programming the User Define Function (cont'd)

- When 'y' is the reply for Save Data or Overwrite Existing data,

  "Input Name: " is displayed

  A user define function name must be entered with a maximum of 11 characters.

- Press the Mode Top Menu Select function to return to the previous scan mode, if necessary.

The next time a programmed User Define or A/N key is pressed, the recorded keystroke or keystroke sequence will be performed by a single key operation.

Hints

Ctrl, 1

If selecting Set Up Top Menu with Custom Display, System Parameter or Preset Program as part of the User Define Sequence, press **Ctrl** and **1** simultaneously to set the sub-menu page to one. Press **Set** the appropriate number of times to ensure proper movement to the desired sub-menu page.

Blue Shift, S

A pause can be valuable in a User Define or A/N key sequence, especially if it is desired to program a key to toggle functions on/off, between two different settings or between selections.

Enable the **Blue Shift** key and press **S** to add a pause in the User Define or A/N key programming sequence.

With a pause in the user define sequence, the first time the User Define or A/N key is pressed, all steps will be executed up to the pause. The next time the key is pressed, all steps will be executed from the pause to the end (or next pause). This is especially useful in programming "toggle" functions.

User Define Key Program Example

The following is a brief example of programming a user define sequence showing the use of Ctrl, 1 and Blue Shift, S.

As an example, assume that it is desired to turn the measurement “Average Activity” on and off. This parameter is in the Set Up/Preset Program menu page 3. Perform the following steps to program a User Define function to toggle Average Activity:

- Press the **Set Up** top menu key.
- Select and highlight **User Define** in the Set Up Sub-menu.
- Select and highlight **Preset Program** in the Set Up Sub-menu.
- Press **Ctrl, 1** simultaneously (this ensures that the menu page displayed is number one).
- Press **Set** twice.
- **Trackball** to “Average Activity OFF” and press **Set**.
- **Trackball** to “Exit” and press **Set**.
- Enable the **Blue Shift** key (key is lighted) and press **S**. This adds the pause to the sequence.
- Disable the **Blue Shift** key (key is not lighted).
- Select and highlight **Preset Program** in the Set Up Sub-menu.
- Press **Ctrl, 1** simultaneously (this ensures that the menu page displayed is number one).
- Press **Set** twice.
- **Trackball** to “Average Activity ON” and press **Set**.
- **Trackball** to “Exit” and press **Set**.
- Press the desired **User Define** or **A/N** key. This ends the programming operation.

User Define Key Program Example (cont'd)

The first time the User Define or A/N key is pressed, Average Activity will be set to OFF. The second time the User Define or A/N key is pressed, Average Activity will be set to ON. The third time the User Define or A/N key is pressed, Average Activity will be set to OFF. Each press of the **User Define** or **A/N** key toggles the Average Activity setting.

User Define Names & Lock/Unlock

The User Define Key Names & Locks Sub-Menu in the Set Up/System Parameters menu page 3 will allow the user to lock a key, keeping it from being deleted or reprogrammed. This Sub-Menu also allows the user to name or change the name of any user defined key.

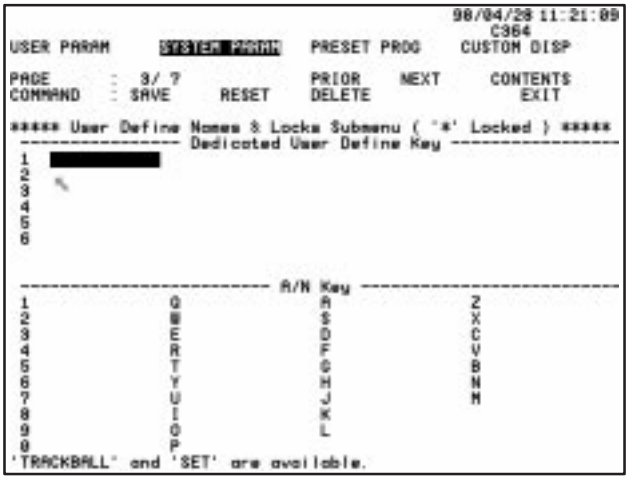


Figure 14–28. User Define Key Names & Locks Sub-Menu

Names

To enter or edit the name of a User Define key:

- Place the arrow cursor to the right of the desired key in the sub-menu.
- Press **Set**.
- In the highlighted area that appears, type in the desired name. Eleven (11) characters maximum.

Lock/Unlock

An asterisk next to the User Define key indicates the key is locked. The key cannot be programmed or the function defined for that key cannot be edited.

To lock or unlock a key:

- Place the arrow cursor on the desired key in the sub-menu.
- Press **Set**.
- An asterisk appears to indicate it is locked. No asterisk indicates it is unlocked.

Hints

Press Shift + User Define key to display the key name on the monitor.

Deleting User Define Functions

To delete a User Define or A/N key sequence:

- Ensure that the User Define or A/N key to be deleted is unlocked.
- Select **Set Up** Top Menu.
- Select User Define function.
- Press the User Define or A/N key number to be deleted.
- Press ‘Y’ (for Yes) to overwrite current data.

A User Define or A/N key can also be re-programmed by writing over (replacing) the existing sequence.

Saving User Define Functions

All user define functions can be saved to MOD by using Setup/Utilities/User Data Back Up/Save. The data can be loaded back on to the system in the event of a hard drive failure.

User Data Back-up

Overview

The Set Up/Utility Menu, option #04 allows the user to back-up (save) all user preset data to MOD. In the event of a system upgrade or catastrophic hard drive failure, the user application presets can be easily loaded back to the system if they have been previously saved to MOD.

Once presets have been backed up, the user data back-up should be performed periodically to update any changes that have been made to the user preset parameters.

Saving Presets

Before saving presets, the MOD must first be initialized (formatted) prior to saving user application preset data.

- Select Set Up/Utility Menu.
- Select #09 Media Initialize and press **Return**.
- Insert a MOD into the drive and press **Return**.

The system then takes the time to format the MOD (approx. 12 minutes).

NOTE: If presets have already been saved on the MOD, the MOD should be initialized again to ensure that old preset data has been deleted from the MOD.

To save presets:

- Enter #04 User Data Backup from the Utility Menu and press **Return**.
- Enter # 1 (Save) and press **Return**.

Saving Presets (cont'd)

- Set media to drive (ensure the MOD is in the drive) and press **Return**.
- Select the exam category name to be saved (01–08) or "All System & Application Data" (09), enter its number and press **Return**.

The system takes a few minutes to save the selected item to the MOD. A succeed or fail message will be displayed.

Eject the MOD, label it and store it in a secure place for future reference.

Loading Presets

To load presets back onto the system:

- Type #04 User Data Backup from the Utility Menu and press **Return**.
- Type #02 Load and press **Return**.
- Set the media to the drive (ensure the MOD is in the drive) and press **Return**.
- Select the application destination and press **Return**.

The system will take a few minutes to load the presets from the MOD to the system hard drive.

- Eject the MOD and store it in a secure place.
- Restart the system. The backup data will be recognized at power up.

Probe Overview

Ergonomics

Probes have been ergonomically designed to:

- Handle and manipulate with ease
- Connect to the system with one hand
- Be lightweight and balanced
- Have rounded edges and smooth surfaces.

Cables have been designed to:

- Connect to system with appropriate cable length
- Stand up to typical wear by cleaning and disinfectant agents, contact with approved gel, etc.

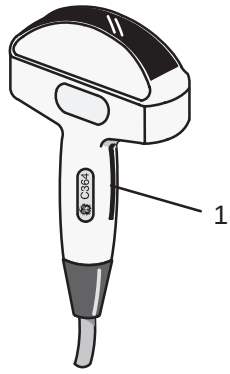
Cable handling

Take the following precautions with probe cables:

- Keep free from wheels
- Do not bend the cable acutely
- Avoid crossing cables between probes.

Probe orientation

Each probe is provided with an orientation marking (refer to Figure 15–1). This mark is used to identify the end of the probe corresponding to the side of the image having the orientation mark on the display.



1 Orientation Marking

Figure 15–1. Orientation Marking on Probe

Labeling

Each probe is labeled with the following information:

- Seller's name and manufacturer
- Operating frequency
- GE part number
- Probe serial number
- Month and year of manufacture
- Probe designation—provided on the probe grip and the top of the connector housing, so it is easily read when mounted on the system and is also automatically displayed on the screen when the probe is selected.

Labeling (cont'd)

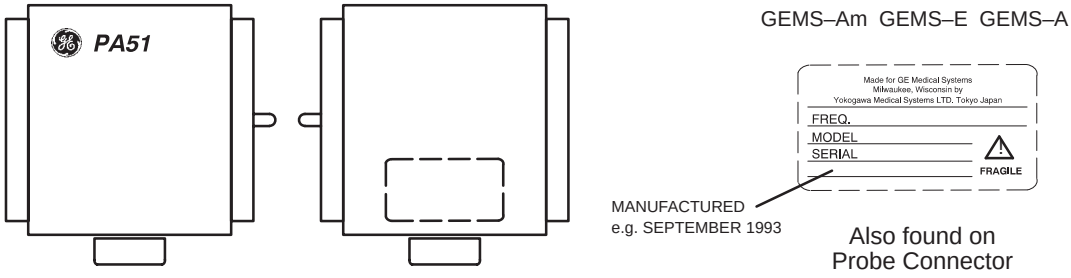


Figure 15–2. Probe Adapter Label

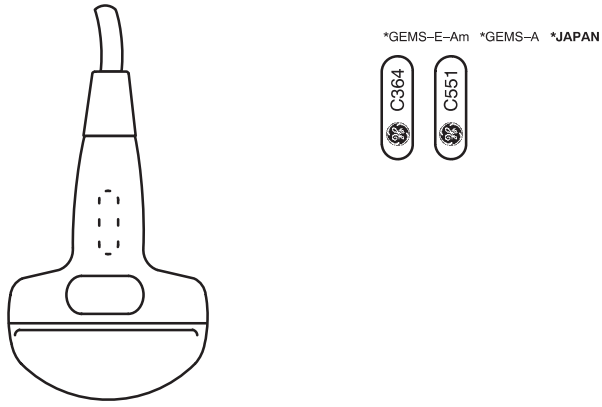


Figure 15–3. Probe Handle Labels

Labeling (cont'd)

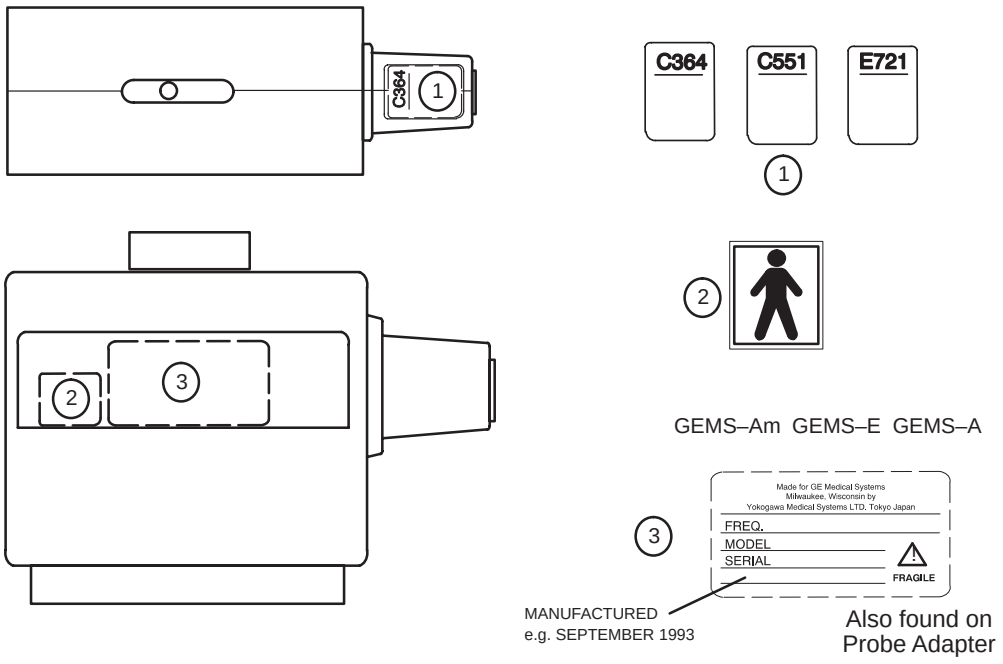
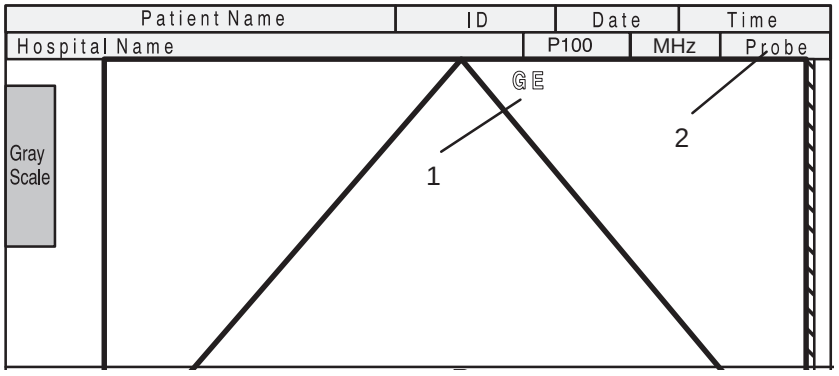


Figure 15–4. Probe Connector Labels



1 Probe Orientation Marker 2 Active Probe

Figure 15–5. Displayed Probe Information

Applications

Below is a list of probes and their intended applications.

Probe Application	B510	C364	C358	C386	C551	C721	E721	ERB7	I739	LA39	546L
Abdomen		●	●	●	●						●
Small Parts									○	●	○
Periph. Vasc.									○	●	●
Obstetrics		●	●	●	●		●				○
Gynecology		○	●	○	●		●				○
Pediatrics			○		○	○				○	
Neonatal						●				○	
Urology		○	○		○		●	●			
Surgery									●	○	
Cardiac	●										
Endocavity							●	●			
Biopsy		✓	✓	✓	✓	✓	✓	✓		✓	✓

● = Main Application ○ = Alternative Application ✓ = Option Kit available

Probe Application	739L	L764	LD	S220	S222	S317	S611	3S	T739	CWD2	CWD5
Abdomen				○	○	●	●	●			
Small Parts	●	●							○		
Periph. Vasc.	●	○							○		●
Obstetrics											
Gynecology											
Pediatrics	○					○	●	○			
Neonatal											
Urology	○			○	○	○		○			
Surgery									●		
Cardiac				●	○	●	●	●		●	
Transcranial					●			○			
Biopsy	✓	✓	●			✓	✓		✓		

● = Main Application ○ = Alternative Application ✓ = Option Kit available

Table 15–2. Probe Indications for Use

Specifications

Probe Designation	Principal Clinical Uses	Image Frequency (MHz)	Doppler Frequency (MHz)
B510	Cardiac	5.0	4.0
C358	Abdom./OB/GYN	3.8	2.5
C364	Radiology/ Obstetrics	3.3	2.5
C386	OB/GYN/Abdom.	3.5	2.5
C551	Radiology/ Obstetrics	5.0	4.0
C721	Neonatal	6.6	5.0
E721	Transvaginal Transrectal	6.6	5.0
ERB7	Urology	7.0	5.0
I739	Intra–operative	6.7	5.0
546L	Deep Vascular/ Small Parts	5.2	4.0
739L	Peripheral Vascular/ Small Parts	6.7	5.0
L764	Mammo, PV & Small Parts	6.6	5.0
LA39	Small Parts	8.7	5.0
LD	Biopsy	3.5	2.5
S220	Cardiac	2.5	2.2
S222	Transcranial, Cardiac	2.9	2.0
S317	Cardiac/Abdom.	3.3	2.5
S611	Cardiac	5.7	4.0
T739	Intra–operative	6.7	5.0
3S	Cardiology	2.4	2.0

B = Bipolar Sector
C = Curved Array (Convex)
E = Endocavitary
I = Intra–operative Linear
L = Linear Array
S = Phased Array Sector
T = Intra–operative Linear

Table 15–3. System Probe Definitions

Specifications (cont'd)

Adapter Designation	Adaptable Probe	System Operates Probe As:
PA 51	CBF	C364
	CAE	C551
	LH	L764
	MTZ	E721
5S	W	S220

Table 15–4. Probe Adapter Usage

Probe Name	Material of Headshell	Use	Type	Mfg. by	Probe Family (Headshell)	Part No.
B510	PU	Intercavity	Biplane Sector	GEYMS		2123593
C358	NORYL	Abdom./OB/GYN	Convex	GEYMS		2193617
C364	PES	Abdom.	Convex	GEYMS	CBF	P9607AB
C386	NORYL	Abdom./OB/GYN	Convex	GEYMS		2147187–2
C551	PES	Abdom.	Convex	GEYMS	CAE	P9607AD
C721	NORYL	Neonatal	Convex	GEYMS	MTZ	2121267-2
E721	PES	Intercavity	Convex	GEYMS	MTZ	P9607AF
ERB7	NORYL	Urology	Convex/Linear	GEYMS		2239590
I739	NORYL	Intra–op.	Linear	GEYMS		2147189–2
546L	NORYL	Abdom. Superficial	Linear	GEYMS		2144266–2
739L	NORYL	Superficial	Linear	GEYMS		2107460–2
L764	PES	Sm. Parts	Linear	GEYMS	LH	2121377-2
LA39	NORYL	Superficial	Linear	GEYMS		2155078–2
LD	PES	Biopsy	Linear	GEYMS		2124318
S220	PES	Cardiac	Sector	GEYMS	W	2121793–2
S222	NORYL	Transcranial	Sector	GEYMS		2159263
S317	NORYL	Cardiac/Abdom.	Sector	GEYMS		2144268–2
S611	NORYL	Cardiac/Neonatal/ Pediatric	Sector	GEYMS		2144267–2

Table 15–5. LOGIQ™ 400 Probe List

Specifications (cont'd)

Probe Name	Material of Headshell	Use	Type	Mfg. by	Probe Family (Headshell)	Part No.
T739	NORYL	Intra–op.	Linear	GEYMS		2147188–2
3S	NORYL	Cardiology	Sector	GEMS		2252157
CWD2	NORYL	Cardiac	Single CWD	GEYMS		2123594
CWD5	NORYL	Peripheral Vascular	Single CWD	GEYMS		2123595
CBF	PES	Abdom.	Convex	GEYMS		P9603AD
CAE	PES	Abdom.	Convex	GEYMS		P9603AE
MTZ	PES	Intercavity	Convex	GEYMS		P9603AU
LH	PES	Sm. Parts	Linear	GEYMS		P9601AS
W	PES	Cardiac	Sector	GEYMS		P9600BH

Table 15–5. LOGIQ™ 400 Probe List (cont'd)

Probe Usage

For details on connecting, activating, deactivating, disconnecting, transporting and storing the probes, refer to *3–30*.

Care and Maintenance

Inspecting probes

After Each Use

Inspect the probe's lens, cable, and casing after each use. Look for any damage that would allow liquid to enter the probe. If any damage is found, do not use the probe until it has been inspected and repaired/replaced by a GE Service Representative.

Keep a log of all probe maintenance, along with a picture of any probe malfunction.

Environmental Requirements

Probes should be operated, stored, or transported within the parameters outlined below.

	Operational	Storage	Transport
Temperature	10°- 40° C 50°- 104° F	–10°- 60° C 14°- 140° F	–40°- 60° C –40°- 140° F
Humidity	30-85% non-condensing	30-90% non-condensing	30-90% non-condensing
Pressure	700-1060hPa	700-1060hPa	700-1060hPa

Table 15–6. Probe Environmental Requirements

Probe Safety

Handling precautions

WARNING

Ultrasound probes are highly sensitive medical instruments that can easily be damaged by improper handling. Use care when handling and protect from damage when not in use. **DO NOT** use a damaged or defective probe. Failure to follow these precautions can result in serious injury and equipment damage.

Electrical shock hazard

The probe is driven with electrical energy that can injure the patient or user if live internal parts are contacted by conductive solution:

- **DO NOT** immerse the probe into any liquid beyond the level indicated by the immersion level diagram. Refer to Figure 15–6 on *15–15*. Never immerse the probe connector or probe adaptors into any liquid.
- **DO NOT** drop the probes or subject them to other types of mechanical shock or impact. Degraded performance or damage such as cracks or chips in the housing may result.
- Inspect the probe before and after each use for damage or degradation to the housing, strain relief, lens, and seal. A thorough inspection should be conducted during the cleaning process.
- **DO NOT** kink, tightly coil, or apply excessive force on the probe cable. Insulation failure may result.
- Electrical leakage checks should be performed on a routine basis by GE Service or qualified hospital personnel. Refer to the service manual for leakage check procedures.

Mechanical hazards

CAUTION

A defective probe or excessive force can cause patient injury or probe damage:

- Observe depth markings and do not apply excessive force when inserting or manipulating intercavitary probes.
- Inspect probes for sharp edges or rough surfaces that could injure sensitive tissue.

Special handling instructions

Using protective sheaths

CAUTION

Biological Hazard

Protective barriers may be required to minimize disease transmission. Probe sheaths are available for use with all clinical situations where infection is a concern. Use of legally marketed, sterile probe sheaths is strongly recommended for intra-cavitary and intra-operative procedures. Use of legally marketed, sterile, pyrogen free probe sheaths is REQUIRED for neurological intra-operative procedures.

Instructions. Custom made sheaths are available for each probe. Each probe sheath kit consists of a flexible sheath used to cover the probe and cable and elastic bands used to secure the sheath.

Sterile probe sheaths are supplied as part of biopsy kits for those probes intended for use in biopsy procedures. In addition to the sheath and elastic bands, there are associated accessories for performing a biopsy procedure which are included in the kit. Refer to the biopsy instructions for the specific probes in the *Discussion* section of this chapter for further information.

Reordering. To reorder sheaths, refer to *16–43*.

CAUTION

Devices containing latex may cause severe allergic reaction in latex sensitive individuals. Refer to FDA's March 29, 1991 Medical Alert on latex products.

CAUTION

Do not use pre-lubricated condoms as a sheath. In some cases, they may damage the probe. Lubricants in these condoms may not be compatible with probe construction.

Probe handling and infection control

This information is intended to increase user awareness of the risks of disease transmission associated with using this equipment and provide guidance in making decisions directly affecting the safety of the patient as well as the equipment user.

Diagnostic ultrasound systems utilize ultrasound energy that must be coupled to the patient by direct physical contact. Depending on the type of examination, this contact occurs with a variety of tissues ranging from intact skin in a routine exam to recirculating blood in a surgical procedure. The level of risk of infection varies greatly with the type of contact.

One of the most effective ways to prevent transmission between patients is with single use or disposable devices. However, ultrasound transducers are complex and expensive devices that must be reused between patients. It is very important, therefore, to minimize the risk of disease transmission by using barriers and through proper processing between patients.

CAUTION

Adequate cleaning and disinfection are necessary to prevent disease transmission. It is the responsibility of the equipment user to verify and maintain the effectiveness of the infection control procedures in use. Always use sterile, legally marketed probe sheaths for intra-cavitary and intra-operative procedures.

For neurological intra-operative procedures, use of a legally marketed, sterile, pyrogen free probe sheath is REQUIRED. Probes for neuro surgical use must not be sterilized with liquid chemical sterilants because of the possibility of neuro toxic residues remaining on the probe.

Probe Cleaning Process

After Each Use

To clean the probe:

1. After each use, disconnect the probe from the ultrasound console and remove all coupling gel from the probe by wiping with a soft cloth and rinsing with flowing water.
2. Wash the probe with mild soap in lukewarm water. Scrub the probe as needed using a soft sponge, gauze, or cloth to remove all visible residue from the probe surface. Prolonged soaking or scrubbing with a soft bristle brush (such as a toothbrush) may be necessary if material has dried onto the probe surface.
3. Rinse the probe with enough clean potable water to remove all visible soap residue.
4. Air dry or dry with a soft cloth.

Special Cleaning Instructions for the E721(MTZ) and ERB7: When cleaning the E721(MTZ) or ERB7 probe, it is important to be sure that all surfaces are thoroughly cleaned. This probe has an adjustable two-part handle that must be disassembled to gain access to all surfaces. To disassemble the handle, completely remove the handle adjustment screw located mid-way between the cable entry and probe tip. The two handle halves and adjustment screw must be thoroughly cleaned along with the main probe shaft as described earlier in step 2. After rinsing and drying is completed, the probe handle can be loosely reassembled for the disinfection process.

Probe Cleaning Process (cont'd)

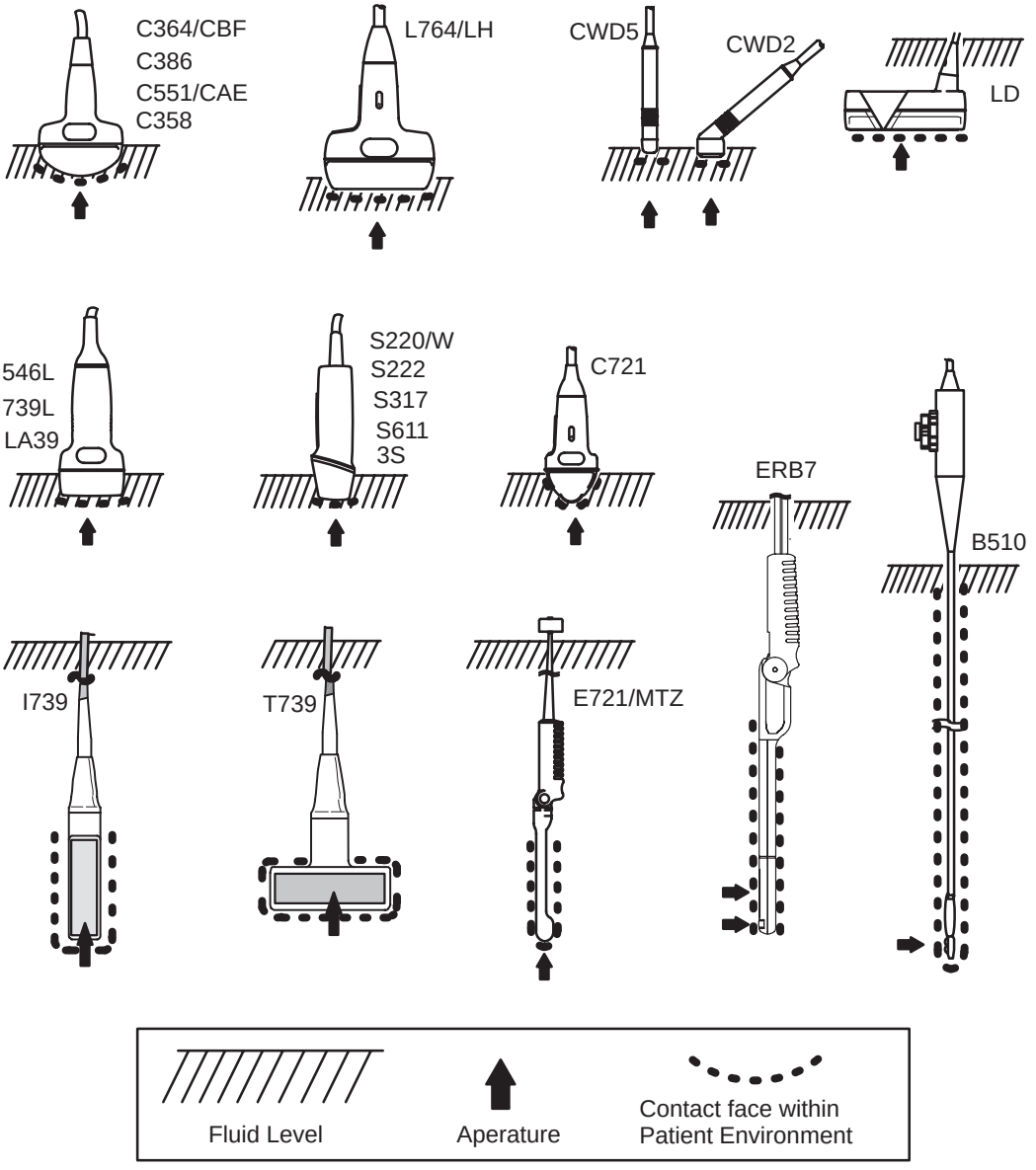


Figure 15–6. Probe Immersion Levels

Disinfecting probes

After Each Use

Ultrasound probes can be disinfected using liquid chemical germicides. The level of disinfection is directly related to the duration of contact with the germicide. Increased contact time produces a higher level of disinfection.

2% Glutaraldehyde-based solutions have been shown to be very effective for this purpose. Cidex is the only germicide that has been evaluated for compatibility with the material used to construct the probes.

CAUTION

In order for liquid chemical germicides to be effective, all visible residue must be removed during the cleaning process. Thoroughly clean the probe, as described earlier before attempting disinfection.

1. Prepare the germicide solution according to the manufacturer's instructions. Be sure to follow all precautions for storage, use and disposal.
2. Place the cleaned and dried probe in contact with the germicide for the time specified by the germicide manufacturer. High-level disinfection is recommended for surface probes and is required for endocavitary and intraoperative probes (follow the germicide manufacturer's recommended time).

   Probes for neuro surgical intra-operative use must NOT be sterilized with liquid chemical sterilants because of the possibility of neuro toxic residues remaining on the probe. Neurological procedures must be done with the use of legally marketed, sterile, pyrogen free probe sheaths.
3. After removing from the germicide, rinse the probe following the germicide manufacturer's rinsing instructions. Flush all visible germicide residue from the probe and allow to air dry.

Disinfecting probes (cont'd)

Special Disinfecting Instructions for the E721(MTZ) and ERB7: To properly disinfect the E721(MTZ) or ERB7 probe, the probe handle can be reassembled loosely so that the entire probe with handle can be immersed in the germicide solution. The adjustment screw must be kept loose so that germicide can penetrate to all surfaces. After immersing, rotate and shake the probe while it is below the surface of the germicide to eliminate air pockets. Allow the germicide to remain in contact with the fully immersed probe, for high level disinfection, according to the germicide manufacturer's recommended time. To remove all germicide residue, final rinsing should be done following the germicide manufacturer's instructions. Remove excess water by shaking and allow to air dry.

CAUTION

Biological Hazard

CREUTZFIELD–JACOB DISEASE
Neurological use on patients with this disease must be avoided. If a probe becomes contaminated, there is no adequate disinfecting means.

Disinfecting probes (cont'd)

WARNING Ultrasound transducers can easily be damaged by improper handling and by contact with certain chemicals. Failure to follow these precautions can result in serious injury and equipment damage.

- Do not immerse the probe into any liquid beyond the level specified for that probe. Never immerse the transducer connector or probe adapters into any liquid.
- Avoid mechanical shock or impact to the transducer and do not apply excessive bending or pulling force to the cable.
- Transducer damage can result from contact with inappropriate coupling or cleaning agents:
    - Do not soak or saturate transducers with solutions containing alcohol, bleach, ammonium chloride compounds or hydrogen peroxide
    - Avoid contact with solutions or coupling gels containing mineral oil or lanolin
    - Avoid temperatures above 60° C.
- Inspect the probe prior to use for damage or degeneration to the housing, strain relief, lens and seal. Do not use a damaged or defective probe.

Coupling gels

CAUTION

Do not use unrecommended gels (lubricants). They may damage the probe and void the warranty.

Applying

In order to assure optimal transmission of energy between the patient and probe, a conductive gel or couplant must be applied liberally to the patient where scanning will be performed.

Precautions

Coupling gels should not contain the following ingredients as they are known to cause probe damage:

- Methanol, ethanol, isopropanol, or any other alcohol-based product
- Mineral oil
- Iodine
- Lotions
- Lanolin
- Aloe Vera
- Olive Oil
- Methyl or Ethyl Parabens (para hydroxybenzoic acid)
- Dimethylsilicone

Planned Maintenance

CAUTION

The following maintenance schedule is suggested for the system and probes to ensure optimum operation and safety.

Do the Following	Daily	After Each Use	As Necessary
Inspect the Probes	X		
Clean the Probes		X	
Disinfect Probes		X	

Table 15–7. Planned Maintenance Program

Probe Discussion

Introduction

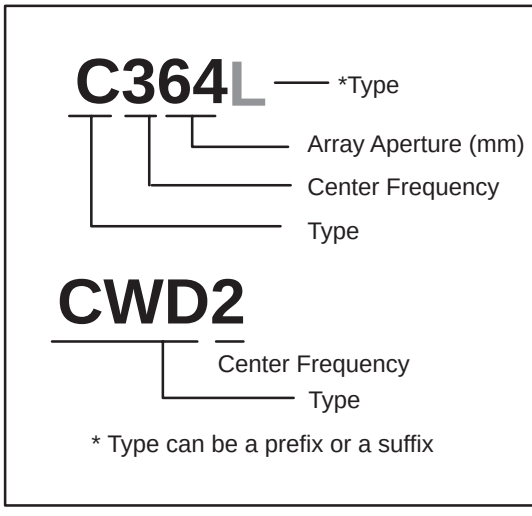
The LOGIQ™ 400 supports four types of probes:

- **Curved Array (Convex)**. Curved Array (Convex) probes, including ‘micro’ convex, are usually designated by the prefix/suffix “C”; the endocavity probe is designated by the prefix/suffix “E”.
- **Linear Array**. Linear Array probes are designated by the prefix/suffix “L”; the linear intra-operative probes are designated by the prefix/suffix “I” or “T”.
- **Phased Array Sector**. Phased Array Sector probes are designated by the prefix/suffix “S”; the biplane TEE probe is designated by the prefix/suffix “B”.
- **Continuous Wave Doppler**. Continuous Wave Doppler probes are designated by the prefix/suffix “CWD”.

CL

B/W Option

Probe naming conventions



TYPE	
B	Biplane TEE
C	Convex
CWD	Pencil CWD
E	Endo (TR/TV)
I	I–shaped intra–operative
L	Linear
S	Sector
T	T–shaped intra–operative

Table 15–8. Probe Naming Conventions

Curved Array (Convex) Probes

The convex probes for the system are the C358, C364 (CBF), C386, C551 (CAE), C721, E721 (MTZ) and ERB7 probes. The ERB7 probe is a bi-plane (convex and linear) probe.

ERB7 probe not currently available in the USA.

Biopsy Guidezone

The type of guide displayed for the convex probes is illustrated below.

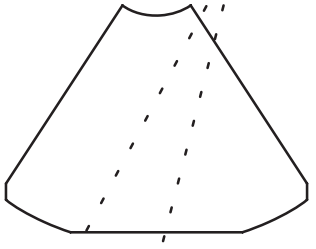
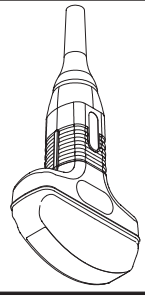
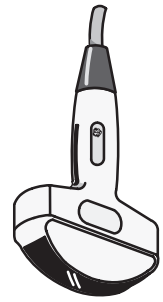


Figure 15–7. Typical Convex Probe Biopsy Guidezone

Probe	Description	Intended Uses	Capabilities and Features	Illustration
C358	The C358 probe is a general purpose probe for obtaining B-Mode, Doppler, and Color Flow data.	• General Purpose	• Wide field of view • Penetration • Good image uniformity • Good B-Mode Resolution • CFM/Doppler detectability • Ergonomics for scanning and cleaning • Biopsy capability	

Curved Array (Convex) Probes (cont'd)

Probe	Description	Intended Uses	Capabilities and Features	Illustration
C364 (CBF)	The C364 probe is a general purpose probe for obtaining B-Mode, Doppler, and Color Flow data.	• General Purpose • Radiology • OB/GYN	• Wide field of view • Penetration • Good B-Mode Resolution • CFM/Doppler detectability • Ergonomics for scanning and cleaning • Biopsy capability	
C386	The C386 probe is a general purpose convex probe for obtaining B-Mode, Doppler and Color Flow data.	• OB/GYN • General Abdominal	• Wideband for B-Mode resolution & homogenity • CFM/Doppler sensitivity • Wide field of view • Large radius for better surface contact • Ergonomics for scanning and cleaning • Biopsy capability	
C551 (CAE)	The C551 probe is a general purpose probe for obtaining B-Mode, Doppler, and Color Flow data.	• General Purpose • Radiology • Obstetrics and Gynecology	• Wide field of view • Good B-Mode Resolution • CFM/Doppler detectability • Ergonomics for scanning and cleaning • Biopsy capability	

Curved Array (Convex) Probes (cont'd)

Probe	Description	Intended Uses	Capabilities and Features	Illustration
C721	The C721 probe is a general purpose probe for obtaining B-Mode, Doppler, and Color Flow data.	• Neonatal • Pediatrics	• Small Footprint • Wide field of view • Good B-Mode Resolution • CFM/Doppler detectability • Ergonomics for scanning and cleaning • Biopsy capability	
E721 (MTZ)	The E721 probe is an endocavitary probe for obtaining B-Mode, Doppler, and Color Flow data.	• Transvaginal • Transrectal	• Wide field of view • Small headshell and probe shaft • Adjustable handle angle • Good B-Mode Resolution • CFM/Doppler sensitivity • Ergonomics for scanning and cleaning • Biopsy capability	
ERB7	The ERB7 probe is a bi-plane (convex and linear) probe for endocavity scanning and stepper volume measurements. The ERB7 can also be utilized for obtaining B-Mode, Doppler, and Color Flow images. **The ERB7 probe is not available in the USA.**	• Transrectal	• Wide field of view • Small headshell and probe shaft • Adjustable handle angle • Good B-Mode Resolution • CFM/Doppler sensitivity • Ergonomics for scanning and cleaning • Biopsy capability	

Linear Array Probes

The linear probes for the system are the I739, 546L, 739L, L764 (LH), T739, LA39, LD and ERB7 probes. The ERB7 probe is a bi-plane (convex and linear) probe, see *15–23* for details.

Biopsy Guidezone

The type of guide displayed for the linear probe is illustrated below.

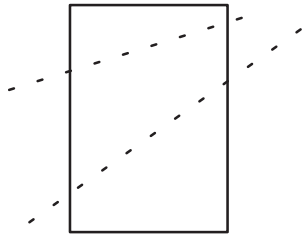
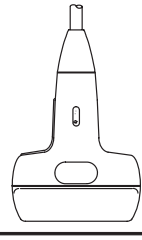
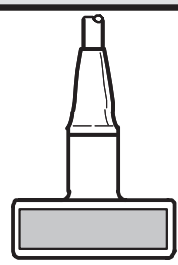
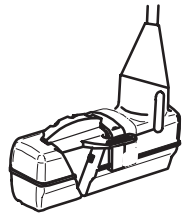


Figure 15–8. Typical Linear Probe Biopsy Guidezone

Linear Array Probes (cont'd)

Probe	Description	Intended Uses	Capabilities and Features	Illustration
I739	The I739 probe is a linear probe intended for intra-operative applications.	• Intra-operative imaging • Superficial imaging for organs with space constraints	• Low height "I" shaped micro-case • Long and light probe cable • Wideband for B-Mode resolution & homogenity • Slant Scan • CFM Doppler sensitivity • Ergonomics for scanning and cleaning	
546L	The 546L probe is a general purpose linear probe for obtaining B-Mode, Doppler and Color flow data.	• Small Parts • Deep vessel vascular • General Abdominal and OB/GYN	• Wide field of view • Slant Scan • Good penetration and resolution for deep vascular • Wideband for B-Mode resolution & homogenity • CFM Doppler sensitivity • Ergonomics for scanning and cleaning • Biopsy capability	
739L	The 739L probe is a general purpose probe for obtaining B-Mode, Doppler, and Color Flow data.	• Small Parts • Peripheral Vascular	• Wide field of view • Slant scan • Wideband for B-Mode resolution & homogenity • CFM Doppler sensitivity • Ergonomics for scanning and cleaning • Biopsy capability	
L764 (LH)	The L764 probe is a general purpose probe for obtaining B-Mode, Doppler, and Color Flow data.	• Mammography • Small Parts • Peripheral Vascular	• Wide field of view • Good B-Mode Resolution • CFM Doppler detectability • Ergonomics for scanning and cleaning • Biopsy capability	

Linear Array Probes (cont'd)

Probe	Description	Intended Uses	Capabilities and Features	Illustration
T739	The T739 probe is a linear probe intended for intra-operative applications.	• Intra-operative imaging • Superficial imaging for organs with space constraints	• Low height "T" shaped micro-case • Long and light probe cable • Slant scan • Wideband for B-Mode resolution & homogenity • CFM Doppler sensitivity • Ergonomics for scanning and cleaning • Biopsy capability	
LA39	The LA39 probe is a general purpose linear probe for obtaining B-Mode, Doppler and Color Flow data.	• Intra-operative imaging • Superficial imaging for organs with space constraints	• Slant scan • Wideband for B-Mode resolution & homogenity • CFM Doppler sensitivity • Ergonomics for scanning and cleaning • Biopsy capability	
LD	The LD probe is a linear probe for biopsies **CAUTION** A portion of the low sensitivity scan image for the LD probe lies along the hollow portion of its structure used for the biopsy guide sleeve. Keep this fact in mind when performing all biopsies with the LD probe. **The LD probe is available only in Europe.**	• Biopsy	• Ergonomics for scanning and cleaning • High sensitivity of needle echo • Wide field of view	

Sector Probes

CL

The sector probes for the system are the S220 (W), S222, SS317, S611 and B510 probes.

Biopsy Guidezone

The type of guide displayed for the sector probes is illustrated below.

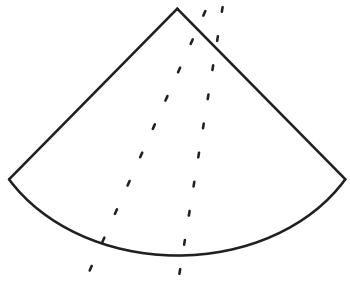
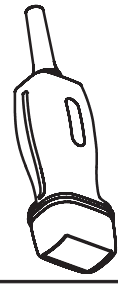


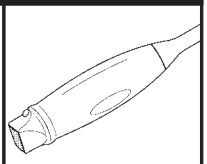
Figure 15–9. Typical Sector Probe Biopsy Guidezone

Probe	Description	Intended Uses	Capabilities and Features	Illustration
S220 (W)	The S220 probe is a general purpose probe for obtaining B-Mode, Doppler, and Color Flow data.	• Cardiology • General Abdominal	• Small footprint • Penetration • Steerable Doppler • Good B-Mode Resolution • CFM Doppler detectability • Ergonomics for scanning and cleaning	
S222	The S222 probe is a general purpose probe for obtaining B-Mode, Doppler, and Color Flow data.	• Transcranial • Cardiology	• Small footprint • Dedicated handle design for Transcranial • Wideband for B-Mode resolution & homogenity • CFM Doppler sensitivity • Ergonomics for scanning and cleaning	

Sector Probes (cont'd)

Probe	Description	Intended Uses	Capabilities and Features	Illustration
S317	The S317 probe is a general purpose sector probe for obtaining B-Mode, Doppler and Color Flow data.	• Cardiology • General Abdomen	• Small footprint • Steerable Doppler • Wideband for B-Mode resolution & homogenity • CFM Doppler sensitivity • Ergonomically designed micro-case for scanning and cleaning • Biopsy capability	
S611	The S611 probe is a general purpose sector probe for obtaining B-Mode, Doppler and Color Flow data.	• Cardiology, Pediatric and Neonatal • Neonatal head	• Small footprint • Steerable Doppler • Wideband for B-Mode resolution & homogenity • CFM Doppler sensitivity • Ergonomically designed micro-case for scanning and cleaning • Biopsy capability	
B510	The B510 probe is a Biplane Transesophageal probe for obtaining B-Mode, Doppler, and Color Flow data. *NOTE: Refer to the User Manual that comes with the probe for details on handling, operation and cleaning.*	• Cardiology from the Esophagus	• Small footprint • Biplane imaging • Steerable Doppler • Good B-Mode Resolution • CFM/Doppler sensitivity • Ergonomics for one hand manipulation of the handle	

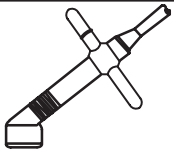
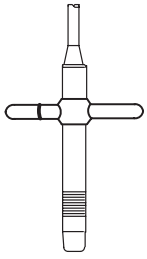
Sector Probes (cont'd)

Probe	Description	Intended Uses	Capabilities and Features	Illustration
3S	The 3S is a general purpose probe for obtaining B-Mode, Doppler, and Color Flow data. *NOTE: The 3S probe has an LED which is not activated with the LOGIQ™ 400.*	• Cardiology • Transcranial • Abdomen	• Small footprint • Dedicated handle design for Transcranial • Wideband for B-Mode resolution and homogenity • CFM Doppler sensitivity • Ergonomics for scanning and cleaning	

B/W Option

CWD Probes

The CWD probes for the system are the CWD2 and CWD5 probes.

Probe	Description	Intended Uses	Capabilities and Features	Illustration
CWD2	The CWD2 probe is a pencil CWD probe for obtaining Continuous Wave Doppler data.	• CW Doppler for Cardiology and Abdomen	• High sensitivity • T-bar support for holding • Ergonomics for scanning and cleaning	
CWD5	The CWD5 probe is a pencil CWD probe for obtaining Continuous Wave Doppler data.	• CW Doppler for Peripheral Vascular	• High sensitivity • T-bar support for holding • Ergonomics for scanning and cleaning	

Biopsy Special Concerns

Precautions Concerning the Use of Biopsy Procedures

WARNING

Do not freeze the image during a biopsy procedure. The image must be live to avoid a positioning error.

Biopsy guidezones are intended to assist the user in determining optimal probe placement and approximate the needle path. However, actual needle movement is likely to deviate from the guideline. Always monitor the relative positions of the biopsy needle and the subject mass during the procedure.

CAUTION

The use of biopsy devices and accessories that have not been evaluated for use with this equipment may not be compatible and could result in injury.

CAUTION

The invasive nature of biopsy procedures requires proper preparation and technique to control infection and disease transmission. Equipment must be cleaned as appropriate for the procedure prior to use.

- Follow the probe cleaning and disinfection procedures and precautions to properly prepare the probe.
- Follow the manufacturer's instructions for the cleaning of biopsy devices and accessories.
- Use protective barriers such as gloves and probe sheaths.
- After use, follow proper procedures for decontamination, cleaning, and waste disposal.

CAUTION

A portion of the low sensitivity scan image for the LD probe lies along the hollow portion of its structure used for the biopsy guide sleeve. Keep this fact in mind when performing all biopsies with the LD probe.

CAUTION

Improper cleaning methods and the use of certain cleaning and disinfecting agents can cause damage to the plastic components that will degrade imaging performance or increase the risk of electric shock. Refer to probe safety and handling precautions on *15–11*.

Preparing for a Biopsy

Displaying the Guidezone

Activate the Biopsy Zone by selecting it from the B-Mode Sub-Menu.

B	4/4		
Biopsy Zone	Image Rotatn	Rejectn	Edge Enhance
SGL	0DEG	30	MID

Figure 15–10. B-Mode Sub-Menu (Biopsy Zone)

If the single fixed angle (SGL) was selected as the needle guide type in Set Up/Custom Display page 1, the fixed zone angle is displayed.

If the needle guide type selected is multiple angle (MULTI), the Biopsy Zone up/down arrow keys can be used to cycle through the angle selections MBX1, MBX2, MBX3 and OFF.

The Biopsy Guidezone adjusts along with image adjustments, such as image inversion/rotations, zoom and depth changes.

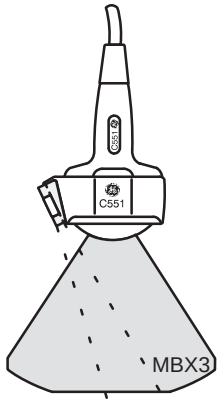
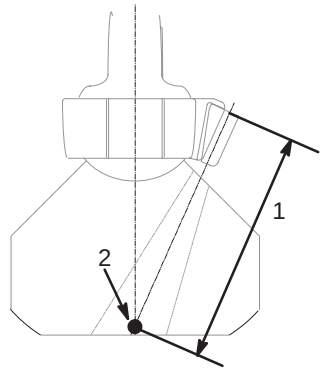


Figure 15–11. Biopsy Guidezone Example

Determining Needle Length

*NOTE: Press the **Measurement** key once to display the integrated biopsy depth cursor and center line while the guidezone is present. Use the **Trackball** to measure the needle length. Needle length is from the top of needle barrel to the target.*



1 Needle Length
2 Target

Figure 15–12. Needle Length Measurement

CAUTION

Pressing measurement while the biopsy guidezone is displayed will add a line down the center of the guidezone with a depth marker that can be adjusted with the Trackball.

The needle may vary from the center line or guidezone for various reasons:

- Needle barrel to needle clearance or strength.
- Bracket manufacturing tolerance.
- Needle deflection due to tissue resistance.
- Needle size chosen. Thinner needles may deflect more.
- Wrong needle guide type selection in Set Up/Custom Display page 1.

The display should be carefully monitored during a biopsy for any needle deviation from the center line or guidezone.

Needle Guide Type Preset Selection

A preset is provided in Set Up/Custom Display page 1 to choose single (SGL) or Multiple (MBX) guidezone angle capabilities. Available selections for respective probes are shown in the chart below.

	Depth in cm at Center Channel			
	Fixed–Angle	Multi–Angle (MBX)		
Probe	**SGL**	**MBX1**	**MBX2**	**MBX3**
C358	n/a	4.0	6.0	8.0
C364/CBF	8.0	4.0	6.0	8.0
C386	n/a	4.0	6.0	8.0
C551/CAE	7.0	4.0	5.5	7.0
C721	3.0	2.0	3.0	4.5
546L	n/a	4.0	5.5	7.0
L764/LH	2.0	2.0	4.0	7.0
739L	2.0	2.0	4.0	6.0
LA39	1.5	n/a	n/a	n/a
S316/UC	8.0	n/a	n/a	n/a
S317	8.0	4.0	6.0	8.0
S611	n/a	4.0	5.5	7.0
T739	2.0	2.0	4.0	6.0

Table 15–9. Biopsy Guide Attachment Selection

DANGER

Failure to match the guidezone displayed to the guide may cause the needle to track a path outside the zone.

It is extremely important that when using the adjustable angle biopsy guides, the angle displayed on the screen matches the angle set on the guide, otherwise the needle will not follow the displayed guidezone which could result in repeated biopsies or patient injury.

NOTE: Although the multi-angle guides are compatible with the Civco Ultrapro and Ultrapro II, it is recommended the multi-angle guides only be used with the Ultrapro II.

Needle Guide Type Preset (cont'd)

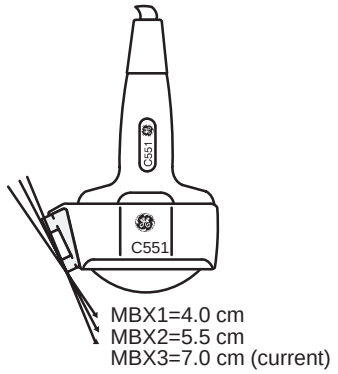


Figure 15–13. Biopsy Guide Depth Selection

DANGER

When the biopsy guidezone is displayed, the message:

"Confirm BX type of Bracket"

is displayed at the bottom of the screen with the angle selected.

Ensure that the MBX type selected for each probe is the same as the angle selected on the actual biopsy guide.

E721 Type Selection

When the E721 probe is attached and active, the needle guide type selection choices in Set Up/Custom Display page 1 are:

- TV0° Reusable metal guide with a 0° offset angle.
- TR5° Civco disposable guide with a 5° offset angle.

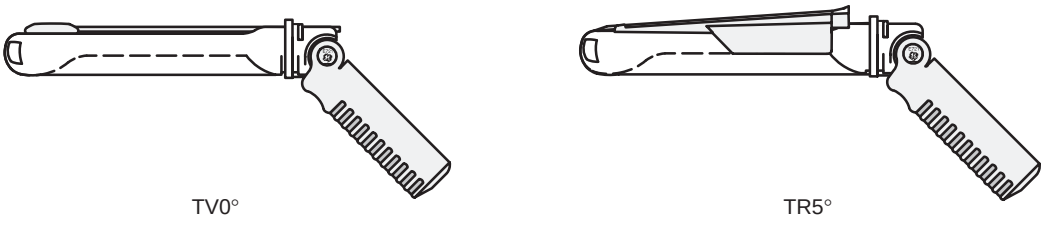


Figure 15–14. Biopsy Guides

ERB7 Type Selection

When the ERB7 probe is attached and active, the needle guide:

- BX Guide attachment with 5 mm increments for vertical orientation (1~8 selections are available).
- GBX Needle Placement guide with 5 mm increments for seed implant template grid alignment.

LD Type Selection

LD Probe Angle (degree)			
MBX1	MBX2	MBX3	MBX4
–30 (30)	–16.1 (16.1)	0	16.1 (–16.1)

Table 15–10. LD Probe Angle

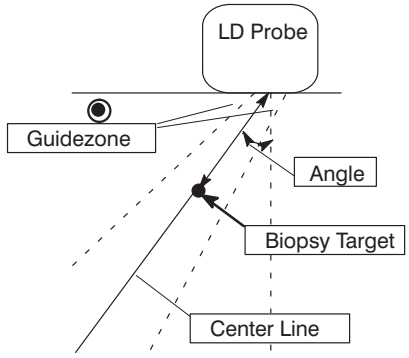


Figure 15–15. LD Probe Alignment

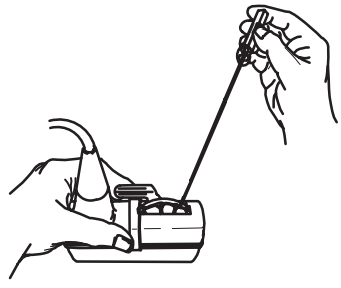


Figure 15–16. LD Probe with Needle Guide

Preparing the Biopsy Guide Attachment

Convex, Sector and Linear probes have optional biopsy guide attachments for each probe. The guide consists of a non-disposable bracket to attach to the probe, disposable needle clip to attach to the bracket, sheath, gel (sterile gel if necessary) and disposable needle barrels.

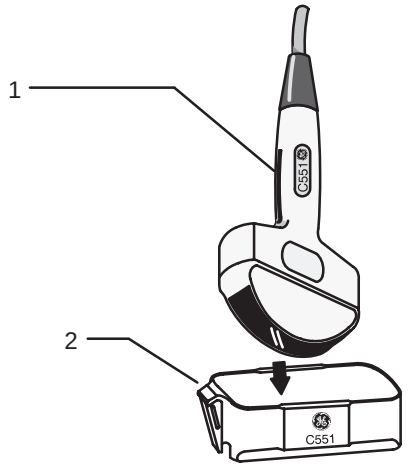
The disposable needle barrels are available for a variety of needle sizes.

CAUTION Please refer to the manufacturer's instructions included in the biopsy kit.

Fixed Needle Guide Assembly

Identify the appropriate biopsy guide bracket by matching the label on the bracket with the probe to be used.

Orient the bracket so that the needle clip attachment will be on the same side as the probe orientation mark (ridge).



1 Probe Orientation Mark
2 Bracket

Figure 15–17. Probe/Bracket Alignment

Attach the biopsy bracket to the probe by sliding the bracket over the end of the probe until it clicks or locks in place.

Fixed Needle Guide Assembly (cont'd)

Place an adequate amount of coupling gel on the face of the probe.

Place the proper sanitary sheath over the probe and biopsy bracket. Use the rubber bands supplied to hold the sheath in place.

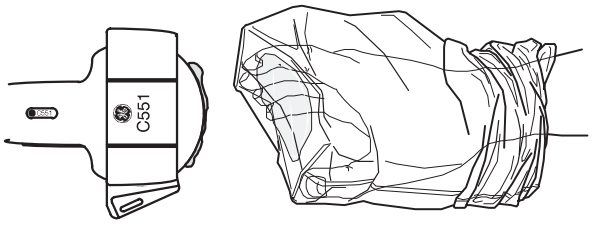
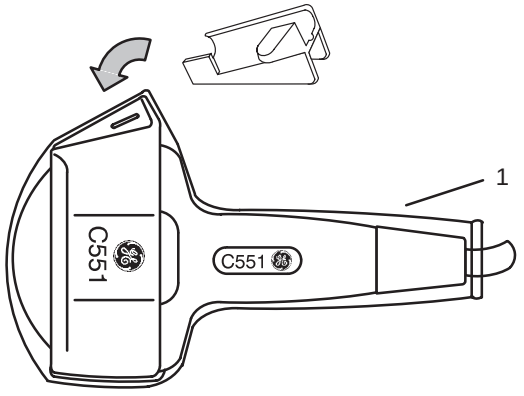


Figure 15–18. Applying Sanitary Sheath

Snap the fixed or adjustable needle clip onto the biopsy guide bracket.



1 Sheath

Figure 15–19. Fixed Needle Clip Attachment

Choose the desired gauge (size) needle barrel. Twist it back and forth to remove it from the plastic tree.

Fixed Needle Guide Assembly (cont'd)

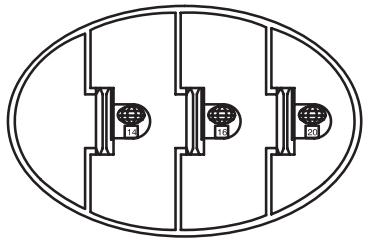


Figure 15–20. Needle Barrels

Place the needle barrel into the needle clip with the desired gauge facing the needle clip and snap into place.

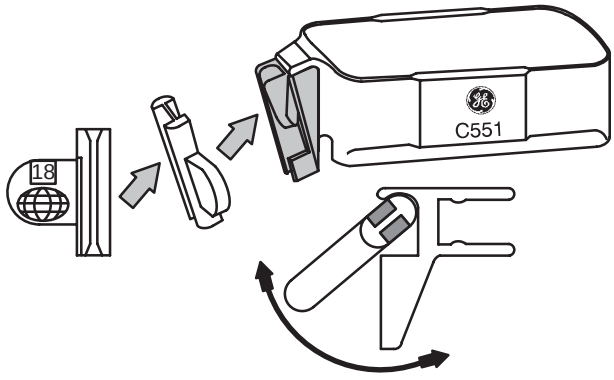


Figure 15–21. Needle Barrel Installation

CAUTION Ensure that all guide parts are seated properly prior to perfoming a biopsy.

Multi-Angle Biopsy Guide Assembly

WARNING *DO NOT attempt to use the multi-angle biopsy bracket and needle guide until the manufacturer's instructions, provided with the biopsy bracket and needle guide in the kit, have been read and thoroughly understood.*

Scan the patient and identify the target for biopsy. Move the probe to locate the target to the center of the image. Enable the system biopsy guidezone and try guidezone angles MBX1 to MBX3 to decide the best angle setting for needle path.

NOTE: The biospy guidezone type can be selected in the Set Up/Custom Display menu page 1.

Identify the appropriate biopsy guide bracket by matching the label on the bracket with the probe to be used.

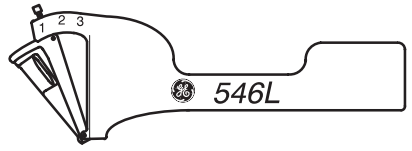
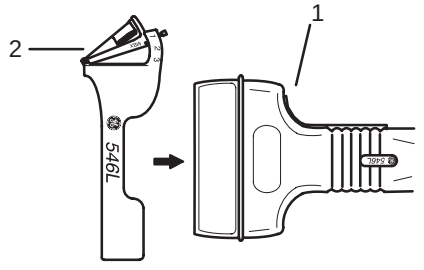


Figure 15–22. S317 Multi-Angle Biopsy Guide Bracket

Orient the bracket so that the needle clip attachment will be on the same side as the probe orientation mark (ridge).



1 Probe Orientation Mark
2 Bracket

Figure 15–23. Probe/Bracket Alignment

Attach the biopsy bracket to the probe by sliding the bracket over the end of the probe until it clicks or locks in place.

Multi-Angle Biopsy Guide Assembly (cont'd)

Pull up on the knob to freely move the needle guide attachment. Align the knob with the selected position of the needle guide attachment from MBX1, MBX2 and MBX3, to match the guidezone display on the ultrasound system.

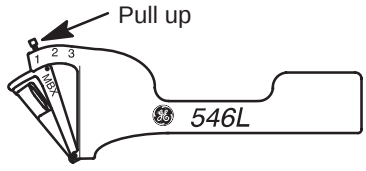


Figure 15–24. Select the angle position

Push the knob down into the desired slot to secure the angle position of the needle guide attachment.

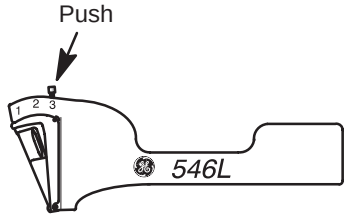


Figure 15–25. Fix the angle position

CAUTION Hold the bracket in place on the probe when pushing the knob to secure the angle position of the needle guide attachment. Excessive force may cause the bracket to release from the probe.

Multi-Angle Biopsy Guide Assembly (cont'd)

Place an adequate amount of coupling gel on the face of the probe.

Place the proper sanitary sheath tightly over the probe and biopsy bracket. Use the rubber bands supplied to hold the sheath in place.

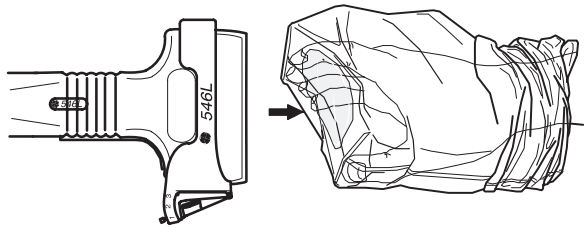
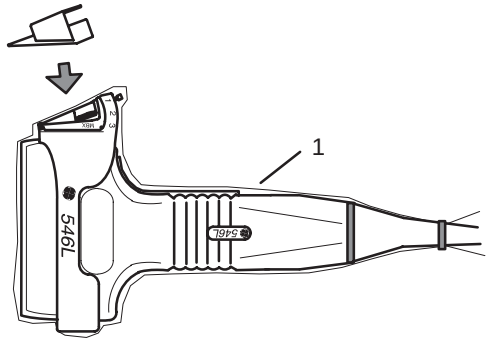


Figure 15–26. Applying Sanitary Sheath

Snap the needle clip onto the biopsy guide bracket.



1 Sheath

Figure 15–27. Fixing the Needle Clip Attachment

Multi-Angle Biopsy Guide Assembly (cont'd)

Push the locking mechanism towards the bracket to secure the lock. Make sure the needle guide is firmly attached to the bracket.

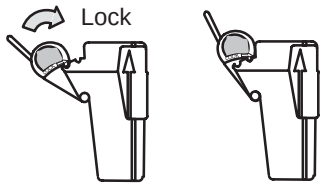


Figure 15–28. Locking the Needle Clip

Choose the desired gauge (size) needle barrel. Twist it back and forth to remove it from the plastic tree.

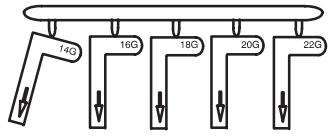


Figure 15–29. Needle Barrel Selection

Place the needle barrel into the needle clip with the desired gauge facing the needle clip and snap into place.

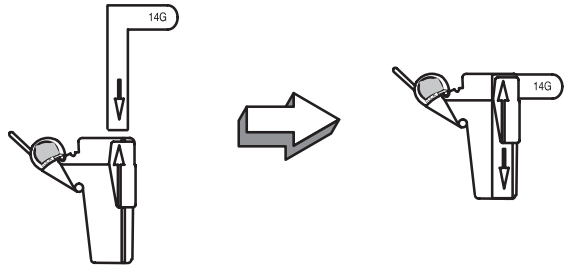


Figure 15–30. Needle Barrel Installation

CAUTION Ensure that all guide parts are seated properly prior to perfoming a biopsy.

Biopsy Need Path Verification

To verify that the path of the needle is accurately indicated within the guidezone on the system monitor, perform the following:

- Properly install the bracket and biopsy guide.
- Scan in a container filled with water.
- Display the biopsy guidezone on the monitor.
- Ensure that the needle echo falls within the guidezone markers.

*NOTE: The guidezone center line can be displayed by pressing the **Measurement** key.*

The Biopsy Procedure

Place coupling gel on the scanning surface of the probe/sheath/biopsy guide assembly.

Activate the biopsy guidezone on the system through the B-Mode Sub-Menu. When using multi-angle guides, ensure that the proper guidezone angle is displayed.

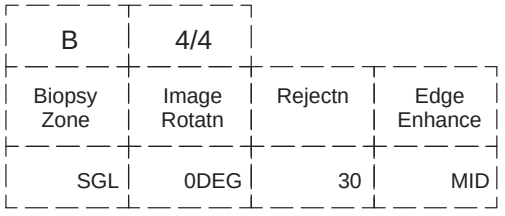


Figure 15–31. B-Mode Sub-Menu (Biopsy Zone)

Scan to locate the target. Center the target in the electronic guidezone path.

NOTE: Enabling color flow would allow for visualization of the vascular structure around the area to be biopsied.

Place the needle in the guide between the needle barrel and needle clip. Direct it into the area of interest for specimen retrieval.

Post Biopsy

When the biopsy is complete, remove the needle barrel, needle clip and probe sheath. Properly dispose of these items in accordance with current facility guidelines.

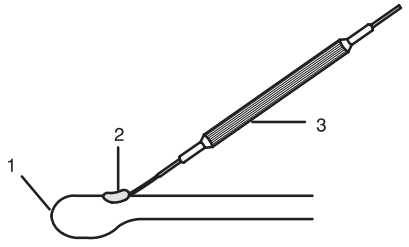
The biopsy bracket can be sterilized in a recommended disinfecting agent and reused.

E721 Probe Biopsy Guide

Preparation

To prepare the E721 for use:

1. Remove the probe from the box and carefully examine it for any damage.
2. If the biopsy guide is to be attached, use the filling removal tool (Figure 15–32) to clean out the attachment area on the probe head.



1 Probe Head 2 Attachment 3 Filling Removal Tool

Figure 15–32. Attachment Filling Removal

3. Clean, then disinfect/sterilize the probe.

NOTE: Ensure that protective gloves are worn.

Preparation (cont'd)

Install the sheath:

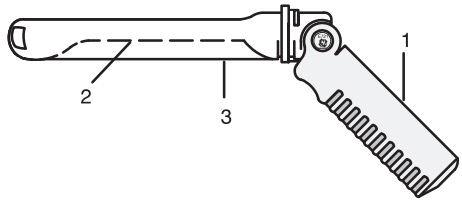
1. Remove the sheath from its package. Do not unroll the sheath.

NOTE: Remember to rinse all sanitary probe sheaths of powder before placing on the probe. Powder can degrade the displayed image.

2. Place an adequate amount of ultrasound gel inside the sheath tip (the gel is between the sheath inner surface and the probe aperture).

NOTE: Ensure that only acoustic coupling gel is used for this purpose.

3. Place the sheath tip over the probe aperture and then pull the sheath end toward the probe handle.
4. Inspect the sheath for nicks, cuts or tears.

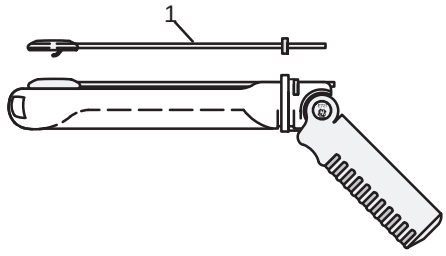


1 Probe Handle 2 Probe Body 3 Sanitary Sheath

Figure 15–33. Probe with Sheath

Preparation (cont'd)

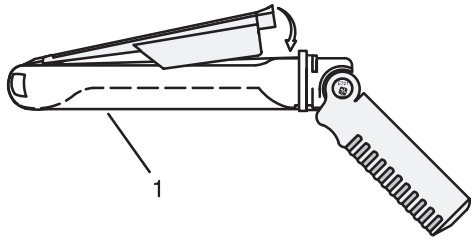
5. Rub a finger over the tip of the probe to ensure all air bubbles have been removed.



1 Biopsy Guide

Figure 15–34. Reusable Metal Biopsy Guide 0° Angle

6. If a biopsy is to be performed, snap the metal or plastic biopsy guide on to the probe over the sheath (Figure 15–34).
7. Place an adequate amount of ultrasound gel on the gel-filled sheath tip **outer** surface.



1 Sanitary Sheath

Figure 15–35. Civco Disposable Biopsy Guide 5° Angle

8. Ensure the guide is properly seated and secure by pushing forward on the needle insertion end of the guide until the attachment node is firmly in place in it's hole.

Scanning

1. Scan the patient. The probe handle orientation mark indicates the image scan plane. Be sure that the **Image Reverse** function is **Off**.

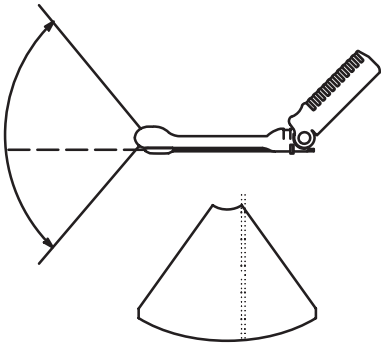


Figure 15–36. Probe and Guidezone Alignment

2. Rotate, retract, or advance the probe, as necessary, to see all pertinent anatomy.
3. If a biopsy is being performed, activate the biopsy guidezone.

CAUTION

Scan the patient to determine the correct puncture depth and site **before** inserting the needle.

Ensure that the proper guidezone (TV0 or TR5) is displayed.

Post Biopsy

If the exam is over:

1. Remove the biopsy guide and twist lock/clamp. Remove and properly dispose of the sheath.
2. Thoroughly clean the probe and equipment. Refer to your institution's infection control guidelines for disinfection/sterilization protocols.
3. After sterilization, return the probe to its carrying case.

Biopsy Probes

Biopsy Guide Attachment				
Probe	**Application**	**Mfg.**	**Needle Sizes**	**Repl. Kit**
C364/CBF	Abdominal, OB/GYN	Civco	14, 16, 18, 20, 22, 25 AWG	Civco Ultra-Pro
C551/CAE	OB/GYN, Abdominal	Civco	14, 16, 18, 20, 22, 25 AWG	Civco Ultra-Pro
C721	Neonatal	Civco	14, 16, 18, 20, 22, 25 AWG	Civco Ultra–Pro
E721	Endocavitary	YMS	Requires 25 cm needles	——
		Civco	18 AWG	——
739L	Small Parts, Peripheral Vascular	Civco	14, 16, 18, 20, 22, 25 AWG	Civco Ultra-Pro
L764	Breast, Small Parts	Civco	14, 16, 18, 20, 22, 25 AWG	Civco Ultra–Pro
LA39	Small Parts, Mammography	Civco	14, 16, 18, 20, 22, 25 AWG	Civco Ultra-Pro
S317	Abdominal	Civco	14, 16, 18, 20, 22, 25 AWG	Civco Ultra-Pro
T739	Intra-operative	Civco	14, 16, 18, 20, 22, 25 AWG	Civco Ultra-Pro

Table 15–11. Probe Biopsy Chart–Fixed Angle

Multi Angle Biopsy Guide Attachment				
Probe	**Application**	**Mfg.**	**Needle Sizes** (not included)	**Repl. Kit**
C358	Abdominal, OB/GYN	Civco	14 through 23 AWG	Civco Ultra-Pro II
C364	Abdominal, OB/GYN	Civco	14 through 23 AWG	Civco Ultra-Pro II
C386	OB/GYN, Abdominal	Civco	14 through 23 AWG	Civco Ultra-Pro II
C551	OB/GYN, Abdominal	Civco	14 through 23 AWG	Civco Ultra-Pro II
C721	Small Parts	Civco	14 through 23 AWG	Civco Ultra-Pro II
546L	Small Parts, Peripheral Vascular	Civco	14 through 23 AWG	Civco Ultra-Pro II
739L	Small Parts, Peripheral Vascular	Civco	14 through 23 AWG	Civco Ultra-Pro II
L764	Breast, Small Parts	Civco	14 through 23 AWG	Civco Ultra-Pro II
S317	Abdominal, Cardiac	Civco	14 through 23 AWG	Civco Ultra-Pro II
S611	Abdominal, Pediatric	Civco	14 through 23 AWG	Civco Ultra-Pro II
T739	Intra-operative	Civco	14 through 23 AWG	Civco Ultra-Pro II

Table 15–12. Probe Biopsy Chart–Multi Angle

System Data

Specifications

System Dimensions

- Height: 51 in (130 cm)
  Taller Console: 54 in (137 cm)
- Width: 21 in (54cm)
- Depth: 37 in (94 cm)
- Weight: approx. 320 lbs (145 kg)
  Taller Console: approx. 364 lbs (165 kg)

Display Monitor

- 15 inch color or B/W display
- 512 Lines
- NTSC & PAL Formats
- Interlace

Operating/Display

- B-Mode
- M-Mode
- PW Doppler
- Color Flow
- Simultaneous B/D & B/CF
- Colorized B & M Display
- Steerable CW (Sector only)
- Non-Imaging Single CW

Doppler

- Steerable Sample Volume (SV)
- Variable SV Sizing
- Variable Spectral Scaling
- Selectable Spectral Smoothing
- Doppler Angle Correction with Calibrated Velocity Scaling
- Variable Sample Size
- Variable Wall Filter
- Scrolling Memory

Measurements

- Distance
- Circumference (Ellipse/Trace)
- Area (Ellipse/Trace)
- Volume (Ellipsoid)
- Angle Between Two Lines (B-Mode)
- Time & Slope (M-Mode)
- Single Velocity (Doppler)
- Time Average Maximum Velocity

Weight

Approximately 320 lbs. (145 kg) for fully configured console.

Image Processing

- 64 Displayed Gray Levels
- Dynamic Range
- Acoustic Zoom
- Image Invert & Rotate
- Independent Dual Image Displays

Linear Imaging

- Steerable B, Doppler, CF: ±30°
- Slant Scan Imaging
- Independent B/CF Steering
- 3.5 –6.7 MHz

Convex Imaging

- Variable Angle: 20° – 80°
- Steerable Scan Angle
- 3.5 – 5.0 MHz

Specifications (cont'd)

Color Flow Doppler

- Selectable Wall Rejection
- Variable FOV Size & Position
- Selectable Color Maps
- Color Baseline Shift
- Color Velocity Tag
- CINE Memory

Calculations

- Heart Rate (BPM, M-Mode)
- Fetal Age (GS, CRL, FL, BPD)
- Estimated Fetal Weight
- PI (Vascular)
- RI (Vascular)
- FVI (Vascular)
- Percent Stenosis (Vascular)
- Two-Velocity Ratio

Electrical Power

- 120/220-240 V_{AC}
- 50/60 Hz
- 1000 VA Max Power Draw

Transducer Types

- Phased Array Sector
- Convex Array
- Linear Array
- Micro-Convex Endocavity (TV/TR) Array
- Pencil CWD

Sector Imaging

- Variable Angle: 20°–90°
- Steerable Scan Angle
- Trapezoidal and Slant Scan Imaging
- 3.3 – 7.5 MHz

Micro-Convex Imaging

- Variable Angle: 20° – 120°
- Steerable Scan Angle
- 3.5 – 6.7 MHz

CINE Memory

- 8 Megabyte Frame Memory (std.)
- Optional 40 megabyte Frame Memory
- 8 megabyte Frame B + CF Memory
- Dual Image CINE Display
- Measurement/Calculation & Annotations on CINE
- Loop Editing
- Variable Speed Display

Data Display

- Biopsy Guidelines with integrated distance measure
- New Patient Data Entry
- OB Summary Report
- GYN Summary Report
- LV Cardiac Summary Report
- Vascular Summary Report
- User Programmable Annotation Libraries for each application

LOGIQ™ 400 Clinical Measurement Accuracy

Basic Measurements

The following information is intended to provide guidance to the user in determining the amount of variation or measurement error that should be considered when performing clinical measurements with this equipment. Error can be contributed by equipment limitations and improper user technique. Be sure to follow all measurement instructions and develop uniform measurement techniques among all users to minimize the potential operator error. Also, in order to detect possible equipment malfunctions that could affect measurement accuracy, a quality assurance (QA) plan should be established for the equipment that includes routine accuracy checks with tissue mimicking phantoms.

Please be advised that all distance and Doppler related measurements through tissue are dependent upon the propagation velocity of sound within the tissue. The propagation velocity usually varies with the type of tissue, but an average velocity for soft tissue is assumed. This equipment is designed for, and the accuracy statements listed on *16–6* are based on, an assumed average velocity of 1540 m/s. The percent accuracy when stated applies to the measurement obtained (not the full scale range). Where the accuracy is stated as a percent with a fixed value, the expected inaccuracy is the greater of the two.

Basic Measurements (cont'd)

Measurement	Units	Useful Range	Accuracy	Limitations or Conditions
Depth	mm	Full Screen	± 5 % or 1 mm	
Distance:				
Axial	mm	Full Screen	± 5 % or 1 mm	
Lateral	mm	Full Screen	± 5 % or 2 mm	Linear Probes
Lateral	mm	Full Screen	± 5 % or 4 mm	Convex Probes
Lateral	mm	Full Screen	± 5 % or 4 mm	Sector Probes
Circumference:				
Trace	mm	Full Screen	± 10 % or 1 mm	
Ellipse	mm	Full Screen	± 5 % or 1 mm	
Area:				
Trace	mm^2	Full Screen	± 5 % or 1 mm^2	
Ellipse	mm^2	Full Screen	± 5 % or 1 mm^2	
Time	s	Timeline Display	± 5 % or 10 ms	M or Doppler
Slope	mm/s	Timeline Display	± 5 % or 1 mm/s	M-Mode Only
Doppler SV Position	mm	Full Screen	± 2 mm	Any Direction
Velocity	cm/s	From 0 to 100 cm/s From 100 to 130 cm/s	± 10 % or 1 cm/s ± 5 % or 1 cm/s	PW Doppler
Point Velocity			± 50 %	Color Flow
Doppler Angle Correction	cm/s cm/s	From 0° to 60° From 60° to 80°	± 5 % ± 12 %	

Table 16–1. System Measurements and Accuracies

LOGIQ™ 400 Clinical Calculation Accuracy

Estimate the overall inaccuracy of a combined measurement and calculation by including the stated inaccuracy from the basic measurement accuracy statements.

CAUTION

Diagnostic errors may result from the inappropriate use of clinical calculations. Review the referenced source of the stated formula or method to become familiar with the intended uses and possible limitations of the calculation.

Calculation formulas and databases are provided as a tool to assist the user, but should not be considered an undisputed database, in making a clinical diagnosis. The user is encouraged to research the literature and judge the equipment capabilities on an ongoing basis in order to assess its utility as a clinical tool.

Warranties

Scope and Duration of Warranties

Product warranties

GE warrants that the ultrasound products are:

1. Free from defects in material, workmanship, and title.
2. Conform to our published product specifications in effect on the date of shipment of the products. The product specifications are available on request.

Patent and copyright warranty

GE warrants that when delivered, the products will not be subject to any valid patent or copyright infringement claim.

The warranty period for all warranties, except the warranty of title and the patent and copyright warranty, is limited in time as shown below:

Ultrasound Part	Time Limit
Ultrasound systems, components, modules, and upgrades	12 Months
Ultrasound probes and transducers	12 Months
Ultrasound water path attachment kit	3 Months

Table 16–2. Warranty Time Limits

NOTE: If a maintenance agreement is desired to extend coverage beyond the manufacturer's warranty, please contact the local service or sales representative.

Patent and copyright warranty (cont'd)

The warranty period begins on the date the products are delivered. But, if GE assembles the products, the warranty period begins on the earlier of:

1. Five (5) days after the date GE notifies you that we have completed assembly and the products are operating in accordance with our published product specifications

   OR

2. The date you first use the products for patient use.

If assembly is delayed for 30 days or more after the date of delivery for a reason beyond our reasonable control, the warranty period will begin on the thirtieth day after the date of delivery.

The warranty period for any product or part furnished to correct a warranty failure will be the unexpired term of the warranty applicable to the repaired or replaced products.

Warranty Exclusions

These warranties are exclusive and in lieu of all other warranties, whether written, oral, expressed, implied, or statutory.

No warranty of merchantability or fitness for a particular purpose applies.

The warranties **DO NOT** cover:

1. Any defect or deficiency (including failure to conform to product specifications) which results, in whole or in part, from:
   a. Any alteration, improper storage, handling, use or maintenance, or any extraordinary use of the products, by anyone other than GE.
   b. Failure to follow any of GE's written recommendations or instructions.
   c. Combining the products with products of others or with incompatible GE products.
   d. Any of your designs, specifications or instructions.

      OR

   e. Any cause external to the products as furnished by GE or beyond our reasonable control.
2. Ultrasound supplies and accessories identified by catalog numbers which start with the letter "E" (which are covered by a separate printed warranty).
3. Products which are not listed in our price pages at the time of sale. Non-listed products are provided with the manufacturer's warranties, if any, GE is permitted to pass on to you. Otherwise, non-listed products are provided AS IS.
4. The payment and reimbursement of any facility costs arising from repair or replacement of the products or parts.

Exclusive Warranty Remedies

Product warranties

If you promptly notify us of your warranty claim and make the product available for service, GE will at our option, repair, adjust, or replace (with new or exchange replacement parts) the non-conforming product or parts of the product. Warranty service will be performed without charge from 8:00 am to 5:00 pm, Monday through Friday, excluding our holidays, and outside those hours at our prevailing service rates and subject to the availability of personnel.

Patent and copyright warranty

GE will defend or settle any suit against you to the extent it is based on an infringement claim which would be a breach of the patent and copyright warranty. If the infringement claim is valid, GE will pay all damages and costs awarded against you due to the breach. In addition, GE will obtain a license for you to continue using the infringing product, provide a non-infringing replacement, alter the product so that it is non-infringing, or remove the infringing product and refund the price (less reasonable depreciation) and any return transportation costs paid by you.

The above describes your exclusive remedies and our sole liability for any warranty claims. You agree that GE and our representatives have no liability to you for:

1. Any penal, incidental, or consequential damages such as lost profit or revenue.
2. Any assistance not required under our quotation.
3. Anything occurring after the warranty period ends.

System Care and Maintenance

Overview

Refer to Section 7 of the LOGIQ™ 400 Service Manual (2127661) for any additional maintenance guidance.

Contact the local Service Representative for parts or planned maintenance inspections. It is recommended that planned maintenance be performed on the system every six months.

Inspecting the System

Examine the following on a monthly basis:

- Connectors on cables for any mechanical defects.
- Entire length of electrical and power cables for cuts or abrasions.
- Equipment for loose or missing hardware.
- Control panel and keyboard for defects.
- Casters for proper locking operation.

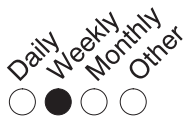
DANGER

To avoid electrical shock hazard, do not remove panels or covers from console. This servicing must be performed by qualified service personnel. Failure to do so could cause serious injury.

Electrical Hazard

If any defects are observed or malfunctions occur, do not operate the equipment but inform a qualified service person. Contact a Service Representative for information.

Weekly Maintenance



The LOGIQ™ 400 system requires weekly care and maintenance to function safely and properly. Clean the following:

- System cabinet
- Monitor
- Operator control panel
- Foot switch
- Video Cassette Recorder (VCR)
- Video Page Printer

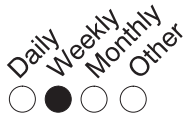
Failure to perform required maintenance may result in unnecessary service calls.

Cleaning the system

Prior to cleaning any part of the system:

1. Turn off the system power.

System cabinet



To clean the system cabinet:

1. Moisten a soft, non-abrasive folded cloth with a mild, general purpose, non-abrasive soap and water solution.
2. Wipe down the top, front, back, and both sides of the system cabinet.

NOTE: Do not spray any liquid directly into the unit.

Cleaning the system (cont'd)

Monitor

Daily ● Weekly ○ Monthly ○ Other ○

To clean the monitor face and filter:

Remove the monitor filter as shown in Figure 16–1.

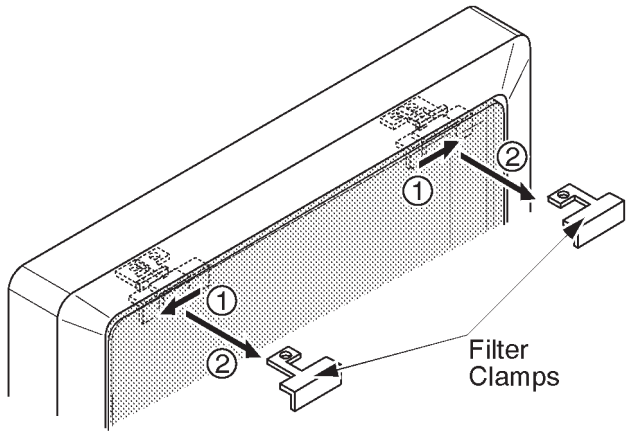


Figure 16–1. Monitor Filter Removal

1. Slide the filter clamps towards the monitor sides.
2. Pull the filter clamps out.

Cleaning the system (cont'd)

Monitor (cont'd)

Use a soft, folded cloth and a glass cleaner solution. Apply the glass cleaner to the cloth. Gently wipe the monitor face and filter.

CAUTION

Do NOT use a glass cleaner that has a hydrocarbon base (such as Benzene, Methyl Alcohol or Methyl Ethyl Ketone) on monitors with the filter (anti-glare shield). Prolonged use of such cleaners will damage the filter (anti-glare shield). Hard rubbing will also damage the filter.

NOTE: When cleaning the monitor, make sure not to scratch the monitor.

After cleaning the monitor face and filter, re-install the filter on the monitor by reversing the removal procedure in Figure 16–1. Insert the filter clamps and slide them inwards securely.

NOTE: Make sure that the filter is securely fixed by the filter clamps. These are important to prevent a hazard from the filter falling. A "click" sound will be heard when the filter clamp is secured by the lock mechanism.

Operator Controls

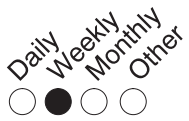
To clean the operator control panel:

1. Moisten a soft, non-abrasive folded cloth with a mild, general purpose, non-abrasive soap and water solution.
2. Wipe down operator control panel.
3. Use a cotton swab to clean around keys or controls. Use a toothpick to remove solids from between keys and controls.

NOTE: When cleaning the operator control panel, make sure not to spill or spray any liquid on the controls, into the system cabinet, or in the probe connection receptacle.

Cleaning the system (cont'd)

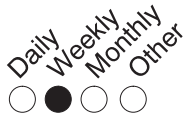
Foot Switch



To clean the foot switch:

1. Moisten a soft, non-abrasive folded cloth with a mild, general purpose, non-abrasive soap and water solution.
2. Wipe the external surfaces of the unit then dry with a soft, clean, cloth.

VCR



To clean the VCR:

1. Turn off the VCR power. If possible, disconnect the power cord.
2. Wipe the external surfaces of the unit with a soft, clean, dry cloth.

NOTE: Do not use a wet cloth or any cleaning fluid because it may enter and damage the unit.

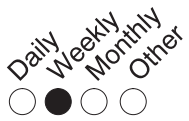
3. Clean the record and playback heads with a soft, non-abrasive cleaning system, according to the manufacturer's instructions.

For more information See the VCR's Operator Manual.

Cleaning the system (cont'd)

Video Page Printer

To clean the external surface of the video page printer:



1. Turn off the power. If possible, disconnect the power cord.
2. Wipe the external surfaces of the unit with a soft, clean, dry cloth.
3. Remove stubborn stains with a cloth lightly dampened with a mild detergent solution.

NOTE: Never use strong solvents, such as thinner or benzine, or abrasive cleansers because they will damage the cabinet.

No further maintenance, such as lubrication, is required.

To clean the surface of the print head:

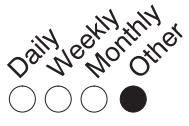
1. Run the cleaning sheet (provided with the printer) through the printer.

For more information

Review the Video Page Printer's Operator Manual for details.

Other Maintenance

Replacing illuminated key caps/lamps



As Necessary

Contact a local Service Representative when a key cap or lamp needs to be replaced.

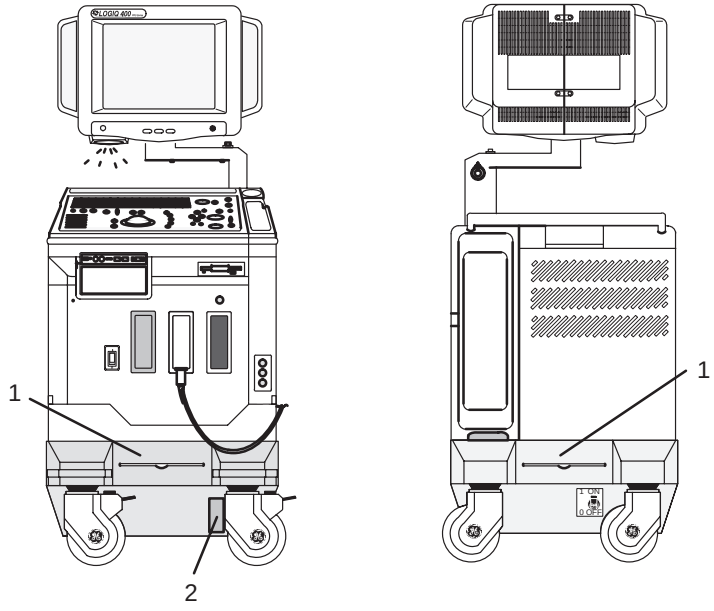
Cleaning the air filters

Quarterly

Clean the system's air filters to ensure that a clogged filter does not cause the system to overheat and reduce system performance and reliability. It is recommended the filters be cleaned *quarterly* (once every three months).

Locating

The 3 air filters are located in the front and back of the system:



1 Console Air Filter Screen
2 Power Supply Air Filters

Figure 16–2. Location of Air Filters

Removing

To remove the console air filters:

1. Lift up on the Velcro tab securing the air filter.
2. Pull out the filter.

To remove the power supply air filter:

1. Pull out and up on the filter cover.
2. Pull the filter screen out.

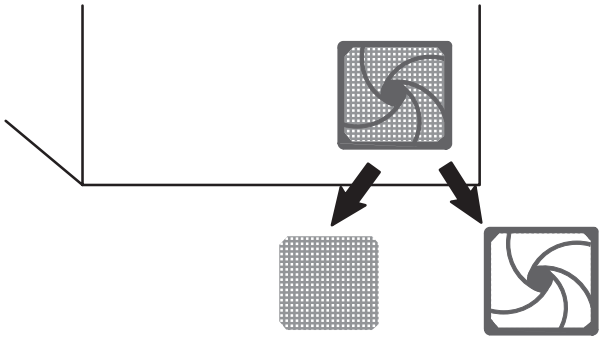


Figure 16–3. Filter Screen Removal

Cleaning

To clean the filter:

1. Be sure to shake the filter in an area away from the system.
2. Wash the filter in a mild soapy solution, rinse and air dry or dry with a cloth.

NOTE: Allow wet filter to dry thoroughly before installing.

3. Slide the filter back into the system.
4. Secure the filter with the Velcro tab or cover.

Troubleshooting

Introduction

Listed in this section are problem or system messages that may be encountered, possible causes for the problem or message, and the appropriate action to take to correct the situation. If additional information or assistance is needed contact your local Applications, Sales or Service Representative.

Trouble images

The LOGIQ™ 400 has the capacity to store as many as eight trouble images. The trouble image files may be saved to MOD for archival or loaded back into the system hard drive for display and review. The trouble images on file can also be retrieved for analysis through Insite™, the exclusive remote diagnostic capabilities of the LOGIQ™ family of products.

To Store a Trouble Image to the Hard Drive

Should the LOGIQ™ 400 ever have a problem imaging, the system has the capability of storing up to 8 trouble images on the hard disk drive. To store a trouble image:

1. Freeze the trouble image.
2. Press the **Ctrl, W** keys simultaneously.

The message *"In progress. Please wait."* is displayed while the image is being saved to the hard drive.

After the image has been saved, the message " Input comment? 'y' or 'n' " is displayed. Press '**n**' for no comments. Press '**y**' to add a maximum of 42 characters as comments to the trouble image file. Press **Return** after commenting is complete.

After the eighth image is saved, there is a warning to indicate the disk space is full. The ninth attempt to save a trouble image will require writing over the first image, etc. (first in, first out).

The message "*Overwrite the old image (DIAGIG00) ? 'y' or 'n'*" is displayed. Press '**y**' to replace the old trouble image with the new one. Press '**n**' to cancel the trouble image store action.

NOTE: Trouble images do not display Patient Name, ID or Hospital Name information. That portion of the image is blanked out and will not be shown when the file is recalled for display.

To Save Trouble Images to MOD

To save trouble images to MOD:

- Select the Set Up Top menu.
- From the Set Up Sub-Menu, select Utility. The Utility Menu appears as shown in Figure 16–4.

NOTE: MOD media used to save trouble images must first be initialized (formatted) in the utility menu selection "09 Media Initialization".

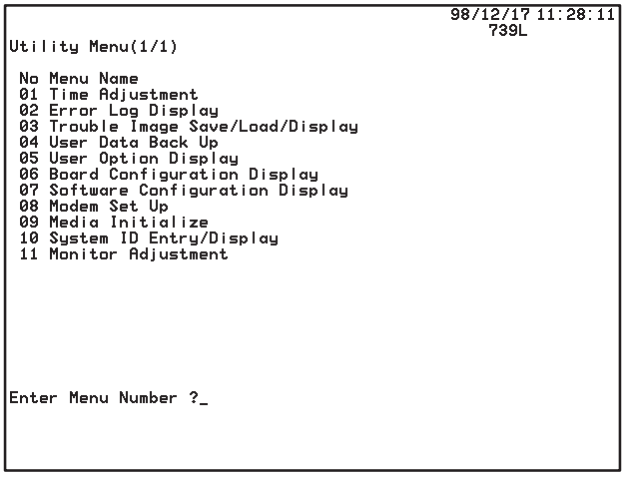


Figure 16–4. Utility Menu

- From the Utility menu, select *"03 Trouble Image Save/Load/Display"* . Enter menu number 03 and press **Return.**

To Save Trouble Images to MOD (cont'd)

- From the Trouble Image Save/Load/Display menu select "1: Save". Enter menu number 1 and press **Return**.

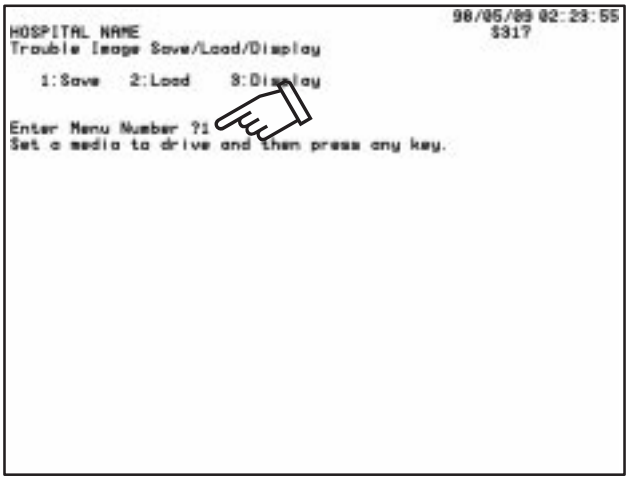


Figure 16–5. Trouble Image Save/Load/Display Menu

- A message will be displayed to place an MOD disk in the drive and press any key to continue.

  The system will read all trouble images from the hard drive and display the image menu in 2 pages of 4 files each. The line available under the file number, date/time and mode information is the 42 character comment line.

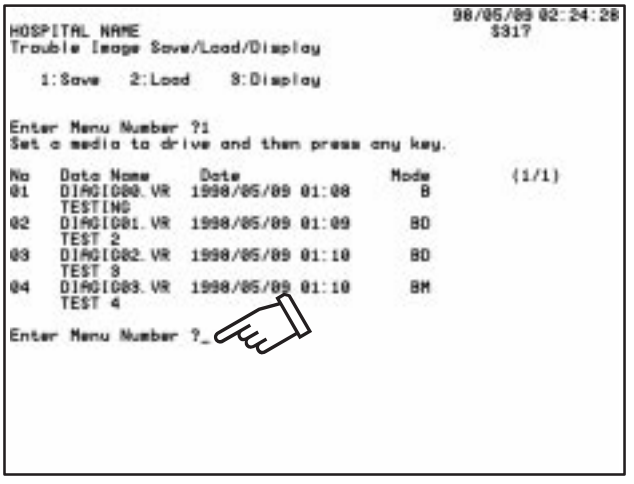


Figure 16–6. Saved Trouble Image Menu

To Save Trouble Images to MOD (cont'd)

Trouble image files must be saved one at a time.

- Enter the number of the file (i.e. "01") and press **Return**.

  The message *"Saving now"* is displayed.

  The system will take a few moments to save the image file.

  After the save operation is complete, the message *"Press 'Y' to continue, or 'Ctrl+R' to return."* is displayed. Pressing 'Y' will prompt for another file menu number to be saved. Pressing Ctrl+R will return to the previous menu screen.

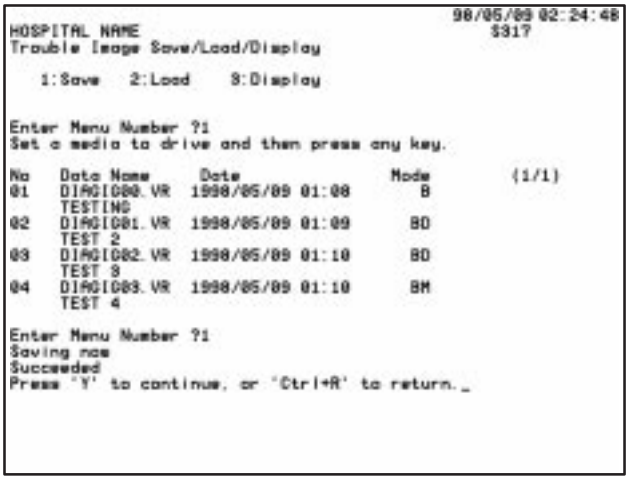


Figure 16–7. Trouble Image Save Complete

To Load Trouble Images from MOD

Trouble images can be loaded from the MOD to the hard drive. To load trouble images from the MOD:

- From the Set Up/Utility menu select *"03 Trouble Image Save/Load/Display"* . Enter menu number 03 and press **Return**.
- From the Trouble Image Save/Load/Display menu select "2: Load". Enter menu number 2 and press **Return**.
- A message will be displayed to place a MOD disk in the drive and press any key to continue.

  The system will read all trouble images from the MOD and display the image menu in 2 pages of 4 files each. The line available under the file number, date/time and mode information is the 42 character comment line.

  Trouble image files must be loaded one at a time.
- Enter the number of the file to be loaded (i.e. "01") and press **Return**.

  The message *"Loading now"* is displayed.

  The system will take a few moments to load the image file.

  After the load operation is complete, the message *"Press 'Y' to continue, or 'Ctrl+R' to return."* is displayed. Pressing 'Y' will prompt for another file menu number to be loaded. Pressing Ctrl+R will return to the previous menu screen.

To Display Trouble Images

Trouble images can only be displayed from the files stored on the hard drive.

- From the Set Up/Utility menu select *"03 Trouble Image Save/Load/Display"* . Enter menu number 03 and press **Return**.
- From the Trouble Image Save/Load/Display menu select "3: Display". Enter menu number 3 and press **Return**.

A menu of the trouble Image files on the hard drive is displayed in 2 pages of 4 files each if necessary.

To Display Trouble Images (cont'd)

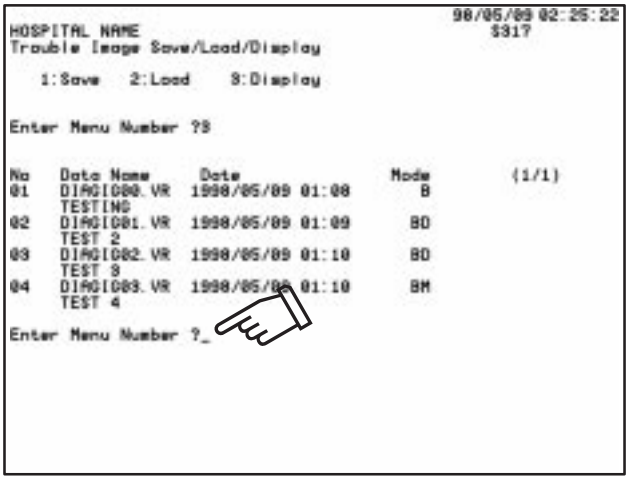


Figure 16–8. Trouble Image Display Menu

- Enter the number of the file to be displayed (i.e. "01") and press **Return**.

  The image will be displayed on the monitor for analysis.

Loose cables

If ECG cables are loose:

1. Check the ECG cable lead connection

   OR

2. Check the connection on the back panel.

If peripheral cables are loose:

1. Check the connections on the back of the peripheral

   OR

2. Check the connection on the back panel.

Display Messages

The LOGIQ™ 400 provides a variety of messages concerning the status of the system's operation.

- System Error Messages are displayed when a hardware problem is detected.
- Operation Error Messages are displayed when the user selects a control that is not appropriate to the current scan mode or function.
- Operation Guide Messages are displayed to inform the operator of a completed task or required action.
- Warning Messages are displayed for patient safety or system failure reasons.
- System Preparation Message is displayed when the system powers up.

These messages are displayed in the single line message area at the bottom of the display. The message display time varies depending on the type of message. Some messages may be accompanied by an audio tone.

For Operation Error Messages, the user can choose to turn on/off the audio tone that accompanies the display in the Set Up/System Parameters page 1.

The User can turn on/off the recording of the error message line in the Set Up/System Parameters page 5 (Maskline Record).

The following tables outline the error messages, their possible cause and cure.

System Error Message Description

Category	Problem/ Message	Possible Cause	Possible Corrective Action
General	SYS ERROR: BUS ERROR. PC: ######## AD: ########	Bus error detected.	*
	SYS ERROR: FILE NOT FOUND. FILE: ############	Requested file not found.	*
	SYS ERROR: BOARD NON EXISTENT. BOARD: #####	Hardware board is non existent.	*
	SYS ERROR: UNEXPECTED CPU EXCEPTION.	Unexpected CPU exception is encountered.	*
	SYS ERROR: ILLEGAL FILE FORMAT. FILE: ############	File format is illegal.	*
	SYS ERROR: SCSI ERROR. DEVICE: ### CODE: ########	SCSI device error is encountered.	*
	SYS ERROR: LOCAL CPU ERROR. BOARD: #####	Local CPU error is encountered.	*
	SYS ERROR: INTERRUPT TIME OUT. BOARD: ##### VECTOR: ##	Time out of waiting interrupt.	*

Table 16–3. System Error Message Description

* If System Error Message occurs, record the message and contact a Service Representative. Be aware that the system may be operating at reduced capabilities, some functions inoperative or not operating at all.

Operation Error Message Description

Category	Problem/ Message	Possible Cause	Possible Corrective Action
General	Register is filled.	Cannot register any more because registration function has reached its limit.	*
	Register is empty.	Cannot delete any more because registration function is empty.	*
	Save data? ‘y’ or ‘n’.	System requires operator reaction to save some data.	Y to save data, N to not save data.
	Overwrite existing data? ‘y’ or ‘n’.	There is pre-existing customized data when saving.	Y to save changes, N to ignore changes.
	Please Select ‘y’ or ‘n’.	A key other than those specified was pressed.	Enter Y or N.
	Improper Data Selected.	The data input is not correct.	Enter correct data.
Recording Devices Color Video Printer	Check Printer. Paper is jammed.	Paper in the printer is jammed.	Locate and clear the paper jam.
	Check Printer. Ribbon Cassette error.	Something is wrong with the ribbon cassette or its setting.	Remove ribbon and re-install.
	Check Printer. Paper Cassette error.	The paper cassette setting is wrong.	Remove cassette, set and re-install.
	Check Printer, Paper Supply empty.	The printer is out of paper.	Add paper.
	Shut the top hatch of printer.	The top hatch of the printer is open.	Open/shut top hatch.
	Shut the bottom hatch of printer.	The bottom hatch of the printer is open.	Open/shut bottom hatch.
	Check Printer, Paper is incorrect.	The placing of paper is incorrect.	Remove casette, adjust and reinstall.
	Check Printer.	There is no response from the printer.	Turn power off and on again.

Table 16–4. Operation Error Message Description

* If System Error Message occurs, record the message and contact a Service Representative. Be aware that the system may be operating at reduced capabilities, some functions inoperative or not operating at all.

Operation Error Message Description (cont'd)

Category	Problem/ Message	Possible Cause	Possible Corrective Action
Recording Devices Multi Image Camera	Check M.I.C., No Exposures Left.	The maximum number of prints have been made.	Reverse cassette or install a new cassette.
	Check M.I.C., No Video Input.	There is no video signal being input to the M.I.C.	Check all video connections.
	Check M.I.C.	There is no response from the M.I.C.	Turn power off, turn power on.
Recording Devices VCR	Check VCR.	There is no response from the VCR.	Check all VCR controls.
	Check VCR. No Cassette.	The VCR has no tape.	Insert tape.
	This function is not available.	The function selected is not available in some situations.	Perform from VCR front panel.
	Protected. Check Tape.	This tape has been write protected.	Use non protected tape.
Line Printer	Check Line Printer. The port isn't set.	The line printer has not been assigned to Port MIC, A or B.	Assign the line printer to Port MIC, A or B.
	Check Line Printer. No Power.	The line printer is powered off or the serial cable is not connected to port MIC, A or B.	Power on the line printer or connect the serial cable to port MIC, A or B.
	Check Line Printer. Printing Error.	An error has occurred in sending data to the line printer or the printer is out of paper.	Resend the report data or add paper to the printer.
	Check Line Printer. Printing isn't finished.	Report Print Buffer is full.	Ctrl + R cannot be used until space is available. The system can store 10 reports for background printing.

Table 16–4. Operation Error Message Description (cont'd)

Operation Error Message Description (cont'd)

Category	Problem/ Message	Possible Cause	Possible Corrective Action
Measurement & Calculation	Measurement(s) Required.	The system requires the operator to input measurement(s).	Input necessary measurements.
	Press 'FREEZE' to complete.	The system requires the operator to press **FREEZE** before completing measurements.	Freeze before all measurements.
	No correct data left.	The system no longer has correct data.	Enter new measurements.
	Manual Calibration Required.	The system cannot calibrate automatically because there is no barcode data on tape.	Reply Yes to manual calibration.
	Barcode sum check error.	There is something wrong with the barcode data.	Retry, use manual calibration.
Scanning Function	Transducer Not Recognized.	An invalid probe has been connected.	Remove invalid probe.
	Transducer Calibration in Process.	Probe change is taking place.	Wait for process to complete.
Option Setting	Option Not Available.	The option to perform the requested function is not available.	Install desired option.
New Patient, ID/Name Function	Invalid, Input a proper data.	Improper data has been input.	Input valid data.
	Press 'RETURN' to exit.	An invalid key has been pressed.	Press **Return**.
	Data range over, Input proper data.	The input data is too large.	Numbers too large.
	Please answer 'y' or 'n'.	A key other than those specified was pressed.	Y for yes, N for no.
	Improper Data Selected.	Improper data has been input.	Input proper data.

Table 16–4. Operation Error Message Description (cont'd)

Operation Error Message Description (cont'd)

Category	Problem/ Message	Possible Cause	Possible Corrective Action
Storage Function	Mismatched System ID. Insert correct media.	The disk is not a registered disk. Images cannot be deleted.	Take disk to system with proper ID.
	The MO is full, change MO.	There is not enough space to store additional images on the disk.	Use a different disk.
	Media is locked.	The disk has been write protected.	Disable the write protection or use another disk.
	Media is either unmounted or unformatted.	The disk is either not formatted or inserted in the drive.	Either format the disk or insert it into the drive.
	Too much data. Store failed.	The hard drive capacity of the hard drive to store additional MOD media search data is full.	Backup MOD media search data from the hard drive to a separate MOD before attempting image storage.
	This function in not available.	During the execution of the background storage process, this message appears if Ctrl + W, Record 1 or Record 2 keys are pressed.	
Miscellaneous	No function is defined.	No function is defined for the User Define key that was pressed.	Use setup menu to define.
	(Y/N)	Operator Decision Requested	Type in Y for Yes or N for No

Table 16–4. Operation Error Message Description (cont'd)

Operation Guide Message Description

Category	Problem/ Message	Possible Cause	Possible Corrective Action
Scan Guide	Invalid CFM image was cleared.	The PRF is changed, and invalid CFM image is cleared.	NA
Miscellaneous	In progress. Please wait.	The system needs several seconds to do something.	NA
VCR Search Guide	Searching.	The VCR is searching the tape.	NA
	Search was completed.	The VCR search is completed.	NA
	Requested information doesn't exist on the tape.	The patient image doesn't exist on the tape.	Perform a system search.
	Requested information doesn't exist in System.	The information doesn't exist on the hard drive.	Check all patient information.
	Can not read Tape ID. Register the new tape? (y/n)	The tape ID cannot be read.	"Yes" to register new tape, "No" to cancel.
	Retry to read Tape ID? (y/n)	The tape ID cannot be read.	"Yes" to retry, "No" to cancel.
	Please play VCR image and freeze at the other frame.	The operator has retried to read the tape ID.	Press **Play** and **Freeze**.
	Save patient information on VCR Tape? (y/n)	Operator pressed key for saving patient information on the VCR tape.	"Yes" to continue, "No" to cancel.
	Save patient information to System? (y/n)	Operator pressed key for saving patient information on the hard drive.	"Yes" to save, "No" to cancel.
	System ID = ##### Tape ID = #####	Tape was mounted or the new tape was registered.	NA
	System ID = ##### New Tape ID = #####	The tape was mounted.	NA

Table 16–5. Operation Guide Message Description

Operation Guide Message Description (cont'd)

Category	Problem/ Message	Possible Cause	Possible Corrective Action
Preset & Setup Function	Data is saved.	The system completed saving the data that was requested.	NA
	Input value by Rocker Button.	Operator can use up/down arrow keys to input the value.	Use the **Ellipse** up/down arrow keys.
	Input character strings.	Operator needs to input some character strings.	Type in characters.
	Select an initial data.	Operator needs to select initial data.	Input proper data.
	'TRACKBALL' and 'SET' are available.	Operator can use the **Trackball** and **Set** key to operate the function.	NA
	Recommended value are copyed.	The system completed copying the data that was requested.	NA

Table 16–5. Operation Guide Message Description (cont'd)

Warning Message Description

Category	Problem/ Message	Possible Cause	Possible Corrective Action
Temperature Safety **WARNING**	WARNING: Temperature error.	System internal temperature is at a maximum, but not caused by fan failure.	Reduce room temperature.
	WARNING: Cooling Fan Failure.	System fan has stopped working properly.	Call service.
	WARNING: Cooling Fan Failure. Temperature error.	System internal temperature is at a maximum, caused by the fan not working properly.	Reduce room temperature; call service.
	WARNING: HV Abnormal.	The High Voltage is abnormal.	Call service.
	WARNING: Probe Temperature error.	The probe temperature is at a maximum.	Call service.
	WARNING: NOW START THE POWER OFF PROCESS.	The system shutdown process has begun.	Call service.

Table 16–6. Warning Message Description

Operator Diagnostics

Introduction

Refer to Section 4–3 of the LOGIQ™ 400 Service Manual (2127661).

The user is able to run diagnostic tests such as:

System Test 1 (reduced version)

Black & White Test Pattern

Color Test Pattern

Graphics Test Pattern

The test patterns can be used to adjust the display monitor or peripheral displays. The system test provides a reduced (pass/fail) version of the diagnostic used to check the LOGIQ™ 400 software.

Probe Selection

Connect and select the C364 probe for diagnostic test purposes.

Accessing Diagnostics

To access the available diagnostics, select the Set Up Top Menu.

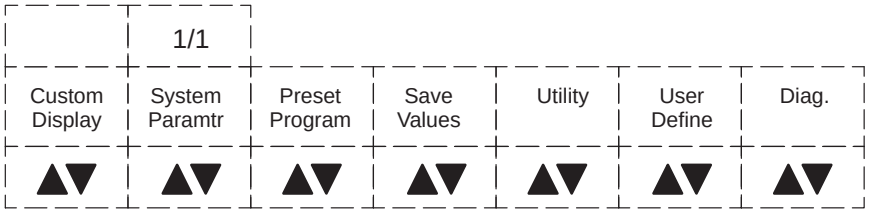


Figure 16–9. Set Up Sub-Menu

Select **DIAG** from the Set Up Sub-Menu. The diagnostic test menu appears on the screen.

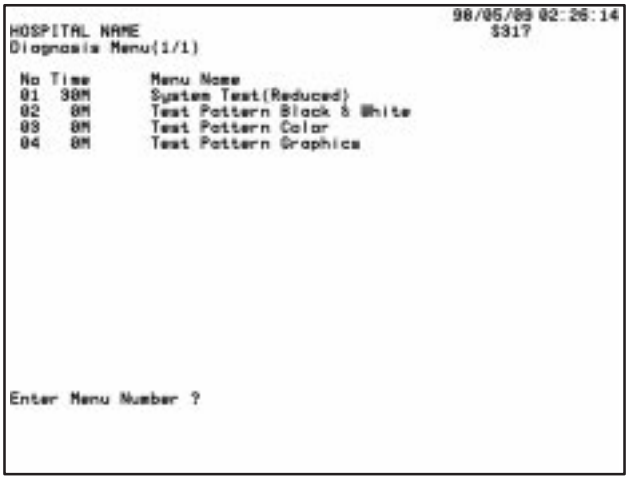


Figure 16–10. Diagnostic Test-Menu

Type in the desired test number and press **Return**. The test begins running or the test pattern is displayed.

EXE TIME is the test execution time. (The time needed to run the test.)

System Test 1 (reduced)

Select 01 from the diagnostic test menu.

System Test 1 is a collection of 24 individual tests that are run in sequence. These are the full or reduced versions of the hardware tests.

Three possible messages will be displayed to the right of the test name.

RUNNING—Test is in progress.
FAILED—Test was not completed successfully for some reason.
PASSED—Test was run and completed successfully.

Figure 16–11 shows the screen display during system Test 1 operation.

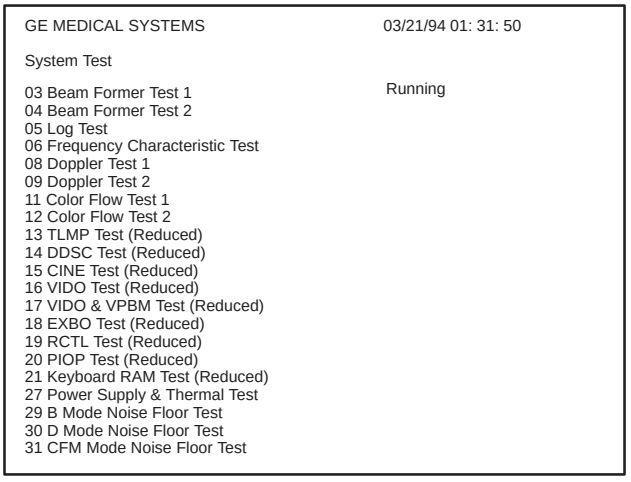


Figure 16–11. System Test 1 Screen Display

Should any test fail, consider that the system may be operating at reduced capabilities. Record the System Test 1 results and contact a local service representative.

Total run time for System Test 1 is approximately 15 minutes.

Test Pattern Black & White

Select 02 from the Diagnostic Test Menu.

A black/white test pattern is displayed.

This pattern can be used to adjust the LOGIQ™ 400 monitor or peripheral displays.

Test Pattern Color

Select 03 from the Diagnostic Test Menu.

A color video test pattern is displayed.

This pattern can be used to adjust the LOGIQ™ 400 or peripheral output devices.

Test Pattern Graphics

Select 04 from the Diagnostic Test Menu.

A graphic video test pattern is displayed.

This checks the graphics generator of the LOGIQ™ 400 and can be used for monitors or peripheral devices.

Assistance

Clinical Questions

For information, call your local Applications, Sales or Service Representative.

For USA Only

GE Clinical Answer Center at 1–800–682–5327 or 262–524–5698.

Service Questions

For service, call your local Service Representative.

For USA Only

GE CARES at 1–800–437–1171

Literature

To request the latest GE Accessories catalog or equipment brochures, call your local Applications, Sales or Service Representative.

For USA Only

Response Center at 1–800–643–6439

Accessories

To place an order, call your local Applications, Sales or Service Representative.

For USA Only

GE Access Center at 1–800–472–3666.

Supplies/Accessories

CAUTION

DO NOT connect any probes or accessories without approval by GE.

The following supplies/accessories have been verified to be compatible with the LOGIQ™ 400 system:

Peripherals

Accessory	Units
S-VHS VCR Tapes	60 Minute S-VHS tape
	126 Minute S-VHS tape
Sony VCR Model SVO-9500MD	Each
Sony B&W Printer Model UP-890	Each
Sony B&W Printer Model UP-890MDG	Each
Sony Color Printer Model UP-1800	Each
IIE Multi Image Camera Model IIE 460	Each
Sony UP-1800 Paper	Color
	B/W
Sony UP-890 Paper	

Table 16–7. Peripherals and Accessories

Console

Accessory	Units
Foot Switch	Each
Vinyl Cover	Each
Extended Cine Memory	Kit

Table 16–8. Console Accessories

Probes

Accessory	Units
B510	Each
C358	Each
C364	Each
C386	Each
C551	Each
C721	Each
E721	Each
ERB7	Each
I739	Each
LA39	Each
546L	Each
739L	Each
L764	Each
3S	Each
S220	Each
S222	Each
S317	Each
S611	Each
T739	Each
CWD2	Each
CWD5	Each
PA51 Adapter	Each
S5 Adapter	Each
Probe Cable Arm	Each
Left Side Holder	Each
Special TV/TR Holder	Each

Table 16–9. Probes and Accessories

Gel

Accessory	Units
Thermasonic Gel Warmer	Holds three plastic bottles (250 ml or 8 oz).
Aquasonic 100 Scan Gel	5 liter jug
	250 ml plastic bottles (12/case)
Scan Ultraound Gel	8 oz plastic bottles (12/case)
	1 gallon plastic jug
	Four 1-gallon plastic jugs

Table 16–10. Gel

Disinfectant

Accessory	Units
Cidex Activated Dialdehyde	16/1 qt. bottles
	4/1 gal. bottles
	2/2.5 gal bottles

Table 16–11. Disinfectant

Civco Biopsy Starter Kits (includes bracket)

Accessory	Units
C358 Probe Biopsy Kit	Kit
C364 Probe Biopsy Kit	Kit
C551 Probe Biopsy Kit	Kit
739L Probe Biopsy Kit	Kit
E721 Probe Biopsy Kit	Reusable Kit
	Disposable Kit
ERB7 Probe Biopsy Kit	Kit (Needle Placement Guide)
	Kit (5mm increments)
C721 Probe Biopsy Kit	Kit
L764 Probe Biopsy Kit	Kit
T739 Probe Biopsy Kit	Kit
LA39 Probe Biopsy Kit	Kit

Table 16–12. Probe Biopsy Brackets

Multi-Angle Brackets

Accessory	Units
S317 Probe	Each
C364 Probe	Each
C386 Probe	Each
546L Probe	Each
T739 Probe	Each
739L Probe	Each

Table 16–13. Multi-Angle Brackets

Biopsy Replacement Kits

Accessory	Units
Civco UltraPro	Kit
Civco UltraPro II	Kit
Civco Cleaning Brush for E721 Biopsy Guide	5 Brushes Per Set

Table 16–14. Biopsy Kits

Ultrasound Probe and Cord Sheath Sets

Accessory	Units
Sterile Ultrasound Probe Sheath Set	20 Per Set
Sterile Ultrasound Cord Sheath Set	20 Per Set
Sanitary Rectal/Vaginal Probe Cover	20 Per Set
Sterile Combination Probe and Cord Cover Set	12 Per Set
Sterile Ultrasound Probe Sheath Set for Wide (2.5 and 3.5) Aperture Sector Probes	20 Per Set

Table 16–15. Biopsy Sheath Kits

Physio Accessories

Accessory	Units
Physio Input Panel	Kit
ECG Cables	Set
PCG Sensor	Each

Table 16–16. Patient ECG Lead Wires

Patient Electrodes

Accessory	Units
Adult	Box/300
Pediatric	Box/300
Adult/off center	Box/500
Pediatric/off center	Box/1000

Table 16–17. Patient ECG Electrodes

Contact the distributor, GE affiliate or sales representative for approved peripherals.

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